

ORIGINAL SCIENTIFIC PAPER

Physical Performance and Psychological Status of Professional Football Players with Recurrent Ankle Sprains

Salinee Chaikyakul¹, Supattra Chaibal^{1,2}

¹Physical Therapy Department, School of Allied Health Sciences, Walailak University, Thailand, ²Research Excellence Center for Innovation and Health Products, Walailak University, Thailand

Abstract

This study aims to compare physical performance and psychological status between professional football players with no history of ankle sprain and those with recurrent ankle sprains. The participants in this study included 40 male professional football players from 6 football clubs in Thailand. Participants were classified into two groups, those with no history of ankle sprain (control) and those with recurrent ankle sprains, with 20 participants in each group. All participants were asked to perform four physical performance tests, namely, the weight bearing lunge test, star excursion balance test, vertical jump test, and Illinois agility test; and to complete two psychological questionnaires, assessing anxiety and burnout. The physical test results showed that the posteromedial direction in the star excursion balance test was significantly lower in the recurrent ankle sprain group compared to the control ($p < 0.05$). There were no differences in anterior and posterolateral directions. In addition, there were no significant differences in weight bearing lunge, vertical jump, and Illinois agility between the groups. The results of the psychological questionnaires showed a significant difference in terms of the achievement dimension of burnout between the groups ($p < 0.05$), while in other psychological parameters there was no difference. The difference was partially achieved, only in two tests, while in others there was no difference at all. Therefore, in accordance with the achieved results, the coach and rehabilitation team should raise awareness and include treatment programs to help athletes avoid physical and mental problems associated with recurring ankle injuries.

Keywords: recurrent ankle sprain, professional football players, anxiety, burnout, physical performance

Introduction

An ankle sprain is a common lower extremity injury that occurs 50% of the time during sports activity in healthy people and athletes (Miklovic, Donovan, Protzuk, Kang, & Feger, 2018). In amateur and professional athletes, an ankle sprain mostly occurs in contact and rotational movements such as jumping, landing, and cutting movements (McKay, Goldie, & Payne, 2002). An ankle sprain is defined as an injury of the ligament of the ankle joint, and medial and lateral ligament injuries are caused by excessive force applied

to the medial and lateral sides of the ankle, leading to over eversion and inversion movements, respectively. Lateral ankle sprains occur at a higher incidence than medial ankle sprains (Delahunt & Remus, 2019). Previous studies have shown that an acute ankle sprain does not only damage the structure around the ankle joint but also leads to defects in mechanoreceptors, joint tension, joint pressure, and proprioceptive joint sense; and to movement disability in daily life (Michelson & Hutchins, 1995).

A study about the incidence of ankle sprains in the



Correspondence:

Chaibal S.

Walailak University, School of Allied Health Sciences, Physical Therapy Department, Thasala District, Nakhon Si Thammarat Province 80160, Thailand

E-mail: mybelove.ibubu@gmail.com

Netherlands discovered that only a small number of injured athletes received medical treatment and rehabilitation to improve ankle joint functions, where the structural and functional features after an acute ankle sprain were not fully recovered. For example, more than 70% of people affected by their first ankle sprain still displayed signs and symptoms such as weakness of the calf and intrinsic foot muscle, post-traumatic osteoarthritis, pain, and high risk of recurrent ankle sprains which might develop into chronic ankle instability (CAI) (Stubbe et al., 2015). A previous study has found that recurrent ankle sprains can occur among volleyball, American football, basketball, and football players with an incidence of 46, 43, 28, and 19%, respectively (Herzog, Kerr, Marshall, & Wilkstrom, 2019). An acute ankle sprain causes weakness of the dorsiflexion, plantarflexion, inversion, and eversion of the foot. In addition, it results in tightness of the ankle plantar flexor muscle, tightness of the gastrocnemius and soleus muscles, increased tension of the capsular joint, and limited movement of the talus bone in the posterior direction of the ankle joint (Hubbard, Hertel & Sherbondy, 2006; Frigg, Magerkurth, Valderrabano, Ledermann, & Hintermann, 2007). However, only limited research has examined the effects of recurrent ankle sprains on the functional movement of the ankle joint, such as its range of motion, strength, balance, and agility upon activity. Alghadir, Iqbal, Iqbal, Ahmed, and Ramteke (2020) found the impairment of foot proprioception, static and dynamic balance that tested by degree of foot position sense, single-leg stance time and Y-balance test respectively, in athletes who have grade 1 or 2 ankle sprain within one year compared with the control group. Mitchell, Dyson, Hale, and Abraham (2008) investigate the postural sway in a person with an ankle sprain and functional instability and found that the medial and lateral sway of the functional ankle instability was significantly greater than the control groups. However, these studies were done in the amateur athletes and healthy persons, no study involved the professional player who has a high degree of training.

A physical injury does not only affect physical function and performance but also causes mental impairment in healthy individuals and athletes (Clanton, Matheny, Jarvis, & Jeronimus, 2012). Shadloo and colleagues (2016) found that the probability of recurrent injuries was associated with psychological problems. Among athletes who have had an injury, 19% suffered psychological problems (Gould, Bridges, Udry, & Beck, 1997). Most of the psychological impairment of athletes was related to their physical performance and included anxiety, depression, disappointment, stress, and fear related to the recurrent injury (Podlog & Eklund, 2010). First-time ankle sprain athletes displayed lower self-esteem, fear, and anxiety (Nippert & Smith, 2008). Athletes suffering fear and anxiety have a high risk of getting recurrent injuries or injuries in other areas (Podlog & Eklund, 2010). In addition, a study has found that prolonged anxiety or stress is correlated with burnout and reduced readiness for athletic competitions, eventually leading to a behavioral change and a decline in sports performances among athletes (Nippert & Smith, 2008; van Wilgen, Kaptein, & Brink, 2010). From the literature review, there is still a lack of knowledge about the effects of a recurrent ankle sprain on the psychological profiles, especially the anxiety and burnout in professional ath-

letes. Several studies focused on the fear of reinjury in ankle sprain athletes (Fukano, Mineta, & Hirose, 2020). Kosik et al. (2020) investigated health-related quality of life between adults with CAI, coper and uninjured controls. Results showed that participants with CAI report a higher score of depression and a lower score of ability to participate in social roles and activities than uninjured control.

Currently, only a limited number of studies have focused on physical performance and psychological status related to recurrent injuries, especially among professional football players with recurrent ankle injuries who continue to be exposed to intense physical training and stress conditions. Therefore, the aim of this study was to assess the physical performance and psychological status related to ankle joint injury among professional football players with recurrent ankle sprains.

Methods

Participants

This study employed a descriptive design. Ankle sprain injury data related to physical performance and psychological status were collected from male professional football players within Thai League 3. Forty male professional football players participated in the study. The sample size was calculated with G*Power Version 3.1 using the mean and standard deviation of the posterolateral direction of the star excursion balance test from the study of Doherty et al. (2016) (alpha: 0.05, power: 0.80). Participants (n = 40) were classified into two groups: athletes who have never had an ankle sprain (control group; n = 20) and those who have had a history of ankle sprains in only one leg more than one time (recurrent ankle sprain group; n = 20). Participants who had experienced ankle sprains in both legs; knee injury involving the ligament, bone, or meniscus; back and lower limb pain within seven days; fractures; or post-operative lower limb surgery were excluded from the study. The inclusion criteria for participant recruitment included: 1) age between 18-35 years, 2) playing in a professional football club for more than one year, 3) regular training with a team more than five days per week for at least two hours per day, and 4) Cumberland Ankle Instability score of less than 27 for the recurrent ankle sprains group. A recurrent ankle sprain was defined as an ankle sprain occurring for an athlete more than one time within three years before the study. An ankle sprain was identified as an injury to the ankle ligament that causes pain, swelling, redness, warmth, and limited function of the foot and ankle; and that prevents that participant from training with their team for at least three days. All participants signed an informed consent form before participating in the performance tests. Ethical approval was obtained from the Human Research Ethics Committee of Walailak University, Thailand (WUEC-20-306-01).

Procedure

All participants were asked to complete a questionnaire about their general information (age, weight, height, and body mass index), health status, training details and history of ankle sprains, as well as the type and number of injuries that they had sustained in the previous three years. To assess ankle instability, the Cumberland Ankle Instability questionnaire was provided for the participants to complete. All participants were asked to complete two additional ques-

tionnaires for psychological assessment, including a revised version of the Competitive State Anxiety Inventory-2 and the Athlete Burnout Questionnaire. Afterward, all participants performed four functional performance tests related to the ankle joint in the following order: weight bearing lunge test, star excursion balance test, vertical jump test, and Illinois agility test. These tests assisted in examining the dorsiflexion range of motion during weight bearing, dynamic balance, power, and agility performances, respectively. Before the test, resting heart rate, blood pressure, oxygen saturation, and rate of perceived exertion were measured. Participants were allowed to rest between each test until their vital signs returned to resting conditions.

Physical performance tests

Weight bearing lunge test

The weight bearing lunge test (WBLT) was performed to measure the dorsiflexion range of motion of the ankle joint during weight bearing. The participants performed the WBLT on their injured limb for the recurrent ankle sprain group or on a randomized limb for the control group. The participants were instructed to stand in a tandem stance with the test limb in the front, to bend their knee and touch the wall, and to maintain heel contact with the ground. The participants placed their untested limb behind the tested limb in a comfortable position, placed their hands on the wall to maintain stability, and moved their test foot away from the wall. The maximum horizontal distance from the toe to the wall was measured using a tape when participants performed maximum ankle dorsiflexion with heel contact with the ground (Hall & Docherty, 2017). The participants performed three practice trials followed by three test trials.

Star excursion balance test

The star excursion balance test is a clinical test aimed to detect functional performance deficits associated with lower extremity pathology and reflects ankle strategy for balance control during weight bearing (Hertel, Braham, Hale, & Olmsted-Kramer, 2006). The participants were instructed to stand on the ankle sprain side for the recurrent ankle sprain group or on a randomized side for the control group. While standing on a single limb, the participants stretched out their reaching limb along each reaching line as far as possible, lightly touched the line with the most distant part of the reaching foot without shifting weight to the reaching limb, and then returned the reaching limb back to the center. If the participants touched heavily on the reaching point, touched the ground with the reaching foot for stabilization, or lifted or shifted any part of the stance foot during the trial, the trial was considered incomplete. The distance reached by the reaching foot on the line was measured (Gribble, Hertel, & Plisky, 2012). The test was repeated three times each for the anterior, posterolateral, and posteromedial directions.

Vertical jump test

The vertical jump height was measured through the Vertec Vertical Jump® apparatus (USA) with longitudinal cells of 1.5 cm. The participants were instructed to stand with legs shoulder-width apart and with one hand extended over the head to touch the Vertec slate, and the number was recorded. Then, the participants were asked to perform a maximum jump with as much hip and knee flexion as

possible. The test was repeated three times with a 2-minute rest between each repetition, and the maximum value was recorded.

Illinois agility test

For the Illinois agility test, the participants were instructed to run through a field, 10 meters in length and 5 meters in width, with four cones placed at the corners of the field and four cones down the center length of the field. The participants started at one corner of the field and had to run after cones placed in eight positions. The participants had to swerve between cones while running through the four cones placed down the center length of the field. The test started on the “go” command, and the participants had to run as fast as possible. Performances were recorded in seconds using a timer. The test was repeated three times, and the best score was used for analysis.

Psychological assessment

The Competitive State Anxiety Inventory-2 (CSAI-2R) questionnaire in a Thai version that based on the original version of Martens and colleagues was used to assess competitive state anxiety in athletes, consisting of three subscales: cognitive anxiety, somatic anxiety, and self-confidence (Choosuan, Ratrujithong, & Tungthongchai, 2019). The severity of anxiety was classified into low, moderate, and high levels. The Athlete Burnout Questionnaire (ABQ) in a Thai version was used for assessing athlete burnout symptoms (Polyotha et al., 2014). It consisted of three dimensions including emotional/physical exhaustion, sport devaluation, and a reduced sense of accomplishment. This questionnaire was composed of 15 items, with 5 items for each dimension. All items were semantically anchored on a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always), and means were computed to obtain subscale scores.

Statistical analysis

Statistical Package for Social Sciences (SPSS) for Windows was used for statistical analysis. The characteristics of the participants (age, weight, height, BMI, and Cumberland Ankle Instability score), burnout score, and physical performance parameters (weight bearing lunge, star excursion balance, vertical jump, and Illinois agility) were examined with an independent t-test to determine differences among the two groups. The difference relative to the Revised Competitive State Anxiety Inventory score between the groups was tested by Mann-Whitney U tests since the distribution of data was not normal. The significance level was set to $p < 0.05$ for data analysis.

Results

Participants in the recurrent ankle sprain group have the experience of ankle sprains more than one time (average 3 ± 1.25 times) for only one leg, whereas those in the control group have had no experience of an ankle sprain. The Cumberland Ankle Instability score for the recurrent ankle sprain group was significantly lower compared with the control group (23.50 ± 2.46 and 29.52 ± 0.24 for the recurrent ankle sprain group and the control group, respectively). There was no difference in age, weight, height, and body mass index (BMI) between groups as shown in Table 1.

Table 1. Characteristics of the participants including age, weight, height, body mass index, and Cumberland Ankle Instability score in the control and recurrent ankle sprain group

Characteristics	Mean±SD		p-value
	Control group (n=20)	RAS group (n=20)	
Age (year)	24±4.88	24±3.30	.309
Weight (kg)	67.05±8.46	66.96±5.34	.967
Height (cm)	174.70±8.20	174.38±4.11	.873
BMI (kg/m ²)	21.99±2.58	22.00±1.16	.993
CAI score	29.52±0.24	23.50±2.46	.000*

Legend: RAS group - Recurrent ankle sprain group; BMI = Body Mass Index; CAI score - Cumberland Ankle Instability score; * significantly different compared between groups (p<0.05)

Physical performance

The weight bearing lunge test, star excursion balance test in three directions (anterior, posteromedial, and posterolateral), vertical jump test, and Illinois agility test were performed by all participants. The results showed that only the posteromedial direction of the star excursion balance test was significantly

lower in the recurrent ankle sprain group compared to the control group (p<0.05). However, the anterior and posterolateral directions did not show a significant difference. In addition, there was no significant difference between the groups in weight bearing lunge, vertical jump, or Illinois agility as shown in Table 2.

Table 2. Physical performance of the participants in the control and recurrent ankle sprain groups

Parameters	Control group (n=20)	RAS group (n=20)	p-value
Weight bearing lunge test (cm)	9.68±3.62	9.25±4.13	.608
Star excursion balance test (cm)			
- Anterior	84.22±12.42	83.38±8.52	.108
- Posteromedial	101.69±11.57	94.18±6.10	.044*
- Posterolateral	95.37±13.74	92.29±10.30	.666
Vertical jump test (inch)	22.03±3.92	22.96±2.48	.119
Illinois agility test (sec)	15.85±0.52	13.04±0.76	.052

Legend: RAS group - Recurrent ankle sprain group; * significantly different compared between groups (p<0.05)

Psychological status

The psychological status including athlete anxiety and burnout were evaluated using questionnaires. The results showed a significantly greater reduced sense of achievement dimension of athlete burnout in the recurrent ankle sprain group compared with the control group (p<0.05) without a significant difference in the other dimensions. However, no

significant difference was found for anxiety between the control and recurrent ankle sprain groups as shown in Table 3. The percentages of the control participants in the low, moderate, and high levels of anxiety were 40.00, 60.00, and 0.00%, respectively. In contrast, the recurrent ankle sprain group displayed 20.84, 79.16, and 0.00%, respectively, for the same levels of anxiety.

Table 3. Psychological status including athlete anxiety and burnout of the participants in the control and recurrent ankle sprain groups

Parameters	Control group (n = 20)	RAS group (n = 20)	p-value
RCS Anxiety Inventory	35.50 (23-42)	37.00 (23-44)	.162
Classification of anxiety level			
Low (%)	40	20.84	
Moderate (%)	60	79.16	
High (%)	0	0	
Athlete Burnout Questionnaire			
Emotional and physical exhaustion	2.22±0.45	2.38±0.64	.136
Sports devaluation	1.88±0.75	1.50±0.64	.519
Reduced sense of achievement	2.23±0.39	2.36±0.45	.043*
Total score	6.30±0.94	6.28±0.94	.961

Legend: RAS group - Recurrent ankle sprain group; RCS Anxiety Inventory - Revised Competitive State Anxiety Inventory; * significantly different compared between groups (p<0.05)

Discussion

The purpose of this study was to determine the physical performance and psychological status of professional football

players who sustained recurrent ankle sprains. Only a limited number of studies have focused on these parameters among professional athletes. The main finding of the present study

was the reduced distance of the star excursion balance test only in the posteromedial direction among athletes with recurrent ankle sprains. In addition, the reduced sense of achievement assessed through the Athlete Burnout Questionnaire was significantly higher among the recurrent ankle sprain group compared to the control group.

The present study found that balance control in the posteromedial direction of athletes with recurrent ankle sprains was significantly reduced compared to the control group. This finding is similar to the study of Hertel et al. (2006), which determined that the posteromedial direction of the star excursion balance test is most affected by chronic ankle instability in young adults. Whereas Khuman, Devi, and Kamlesh (2014) demonstrated that people with CAI showed a shorter star excursion balance test reaching distance in all directions compared to healthy asymptomatic participants, with a number of ankle sprains occurring on the same side at 1.43 ± 0.62 times. Dynamic postural control during the star excursion balance test requires the ability to maintain the center of gravity over the base of support without compromising balance. A small reaching distance indicates the reduction ability of dynamic postural control. This might be influenced by impaired neuromuscular control and proprioception. Ankle sprain not only damages the structural integrity of ligaments but also affects mechanoreceptors, joint capsules, and tendons around the ankle complex. Mechanoreceptors provide feedback on joint pressure, tension, movement, and proprioception; and affect postural control upon ankle sprain (Michelson, & Hutchins, 1995; Hertel, 2008).

This study found no significant difference in weight bearing lunge, vertical jump, and Illinois agility performance between the recurrent ankle sprain and control group. This result was in contrast with the findings by Hoch and colleagues that weight bearing lunge was significantly lower in healthy subjects who have CAI (Hoch, Staton, McKeon, Mattacola, & McKeon, 2012). The differences might be due to a different study population; in this study, participants were professional athletes, physically active, and regularly trained at high volume. Almost training for professional football players involves movement and function of the ankle and lower limb muscle; therefore, regular training might promote ankle biomechanics. In addition, the participants of this study could return to training and competition, and the results showed that strength training such as resistance exercise and plyometric training was added into the training program of all teams. Plyometric training, related to the improvement of muscle power, might result in preserved vertical jump performance in athletes with recurrent ankle sprains (Kubo et al., 2007).

In this study, the reduced sense of achievement dimension of athlete burnout was found to be greater among the recurrent ankle sprain group compared to the control group. A sense of achievement is defined as the self-evaluation of sports abilities and achievements (Raedeke & Smith, 2001). Several factors contributing to athlete burnout include extremely high training volume, demanding performance expectations, frequent and intense competitions, inconsistent coaching practices, and negative performance evaluations. Personal characteris-

tics also contribute to burnout such as negative perfectionism, a need to please others, obsessive passion, low self-esteem, and unidimensional self-conceptualization (Malina, 2010; Matos, Winsley, & Williams, 2011). In addition, some overuse injuries may result in long-term health consequences, including burnout and previous illnesses related to burnout in young athletes (DiFiori et al., 2014). A previous study stated that the fear of selection is one stressor for athletes, especially in a professional context, as athletes might lose their income if they do not perform at a high standard. In addition, a football career is considerably shorter than other occupations, and so injury and worry about the risk of injury are unique aspects of elite sports (Stambulova, 2006). However, the overall burnout score in the recurrent ankle sprain group was not different from that of the control group. Moreover, this study found that the competitive state anxiety in athletes was not significantly different between the two groups. This might be caused by three reasons. Firstly, 54.17% of athletes with recurrent ankle sprains in the present study reported their last ankle sprain more than one year before the study. Turner and colleagues reported that a high level of anxiety was found in the acute phase of injury, independent of the area and types of injury; later, the level of anxiety gradually declined when athletes returned to training (Turner et al., 2017). Secondly, a recent study found that the physical performance of athletes with recurrent ankle sprains was not different from the control group except for the posteromedial direction of the star excursion balance test. This suggests that the physical performance of this group of subjects had nearly recovered, and this could be related to a reduction in anxiety. It has been reported that anxiety has a statistically and significantly inverse correlation with an athlete's physical performance, where high performance reduces anxiety (Parnabas, 2015). Finally, rehabilitation programs and social support from friends, family, and coaches might help reduce anxiety (Covassin et al., 2014). However, the researchers did not record data on the treatment and rehabilitation programs that the participants received after an ankle sprain, which is a limitation of this study. Early and appropriate rehabilitation by medical teams might result in rapid recovery and reduced psychological issues.

This study showed a significant difference in the posteromedial direction of the star excursion balance test and in the sense of achievement dimension of athlete burnout in professional football players with recurrent ankle sprains compared to the control. Therefore, it is necessary to be aware that rehabilitation or training programs could improve balance and prevent its further decline, and that mental support could prevent the reduction of the sense of achievement of professional athletes.

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Conflict of interest

The authors have no conflict of interest relevant to this article.

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