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Influence of blistering lesions on foot functionality in hikers

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ABSTRACT

Background: Friction blisters are formed by abrasion from frictional forces on the upper layer of the epidermis and can make physical activity an uncomfortable experience. To our knowledge, no previous studies have considered how these injuries affect the functionality of the foot. For this reason, the main aim of this study was to evaluate foot function in hikers, with or without blisters.

Material and methods: This case-control study examined 298 hikers who walked the Camino de Santiago long-distance trail (in northern Spain); 207 had one or more blistering foot lesions and 91 had no blisters. Socio-demographic and clinical variables were collected, and the number of blisters and their locations on the foot were recorded. All participants self-completed the Foot Function Index (FFI) questionnaire, in their native language.

Results: Pain and disability were significantly greater among the hikers with blisters (pain p=<0.001; disability p = 0.015). However, there were no significant differences in the limitation of physical activity between those with blisters (case group) and the control group (p = 0.144). Neither was there any correlation between the number of blisters and pain, disability or limitation of activity. However, the location of the lesion did influence foot functionality. Blisters on the metatarsal heads were more limiting and caused greater pain (right foot p = 0.009; left foot p = 0.017), greater disability (right foot p = 0.005; left foot p = 0.005), greater limitation of activity (on right foot p = 0.012) and more loss of foot functionality (right foot p = 0.002; left foot p = 0.007).

Conclusion: The hikers with blisters experienced reduced foot functionality in terms of pain and disability. The number of blisters was not related to foot functionality. Blisters located on the metatarsal heads caused the greatest increase in pain, disability and limitation of activity.

1. Introduction

The Camino de Santiago is the collective name for a series of Christian pilgrimage routes of mediaeval origin that lead to the Tomb of Santiago El Mayor in the Cathedral of Santiago de Compostela (Galicia, Spain). Up to 286 different trails have been catalogued, with a total length of 80,000 km in 28 countries [1].

The number of pilgrims on the trail has remained fairly constant since the 1990s. The highest number ever recorded was in 2019, when 347,578 arrived in Santiago [1]. Most hikers carry a backpack equipped with what they expect to need along the route. However, if the weight carried is excessive, this can be a risk factor for injury and/or discomfort in the legs and feet [2].

Hikers and long-distance runners are highly susceptible to blisters [3–5]. Most studies of hiking indicate blisters as the most prevalent foot lesion in hikers [6–11]. Previous investigations of long-distance hikers and backpackers, have reported blistering rates of 54–86% [12,13], of military personnel (57%) [14,15] and of athletes performing ultra-marathons and adventure running (26–76%) [16,17]. Blisters result from abrasion caused by frictional forces applied directly to the upper layer of the skin epidermis, which is transmitted from the stratum granulosum to the stratum spinosum, causing micro-tears between the skin layers [18]. On the foot, these lesions are common and painful [19], and can affect people of all ages, especially during periods of intense physical activity and/or performing different types of sports [20]. Although most friction blisters are uncomplicated, infections can

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develop and provoke severe pain [21,22].

Blisters can turn pleasant exercise into an uncomfortable experience. The US military is well aware of the detrimental effects of blisters on the readiness of its soldiers [23], among whom this lesion can reduce mobility in the field, impair concentration and affect critical decision-making skills [8,24].

To our knowledge, no prior studies have been conducted to consider whether blistering lesions limit physical activity in ordinary hikers, or whether they provoke pain and disability. However, it has been observed that when these dermatological lesions become infected, the pain can cause the pilgrim to leave the trail, or to pause for a few days until the lesion heals. In view of these considerations, we seek to quantify the extent to which these injuries could generate negative impacts regarding pain, disability and the limitation of activity.

The Foot Function Index (FFI) is a validated self-administered questionnaire consisting of 23 items divided into three subscales. It is used to measure the impact of foot pathology on function in terms of pain, disability and activity restriction [25].

In summary, the main aim of this research is to evaluate foot function among hikers with blisters compared to those with no blisters.

2. Material and methods

2.1. Study design

Observational case-control study performed in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [26,27]. Participants were recruited in July 2022.

2.2. Ethics statement

This study was approved by the university's Ethics Committee (Code: DCC.AGS.01.22). All participants were informed of the aims of the study. The study data were collected anonymously, and the ethical principles set out in the Declaration of Helsinki [28,29] were followed at all times.

2.3. Participants

The study sample consisted of 298 hikers (145 men, 153 women) of 37 different nationalities, who were following the French Camino de Santiago (in northern Spain) in the province of León. The sample was divided into two groups: 207 presented one or more blistering lesions on the foot (case group) and 91 had no such lesion (control group).

The sampling format used was convenience and consecutive, selecting the patients who attended the podiatry service at the Siervas de María hostel (Astorga), and who met the following inclusion criteria: a) age at least 18 years; b) native language Spanish, English, Portuguese, French or Italian; c) sign the informed consent form. The exclusion criteria were a) lower limb surgery or musculoskeletal injury in the last six months.

The study data were collected by two podiatrists, each with more than five years' experience.

2.4. Outcome measurements

Sociodemographic and clinical data were collected during a clinical interview, including the distance walked, the number of days walked, history of podiatric attention, preparation for long-distance hiking, the use of moisturising creams during the hike, whether socks were changed during the day's hike, the use of new or used footwear and the use of individualised plantar orthoses and/or walking poles.

The hiker's weight and height and the weight of the backpack were calculated with a calibrated scale and an Astra® stadiometer. An appropriate weight for the backpack was considered to be up to 10% of the hiker's body weight [30–32].

All bullous lesions and their location (forefoot, hindfoot) were recorded. Participants' feet were classified, using the Foot Posture Inde x [33] as normal (score 0–5), pronated (score 6–12) or supinated (score −12 to −1).

Subsequently, each participant self-completed the Foot Function Index (FFI) questionnaire in their own language: Spanish [34], English [25], Portuguese [25,35,36], French [37] or Italian [38,39]. This questionnaire measures the impact of pathologies such as blisters on foot function [25]. It is made up of 23 items distributed in three subscales: pain (nine items, except the Italian version, which has five), disability (nine items), and activity limitation (five items, except the Italian version, which has three). The score of each subscale was obtained by dividing the total score marked for all items on that subscale by the total possible score for that subscale x100. The final score of the questionnaire was calculated using the formula: sum of the final percentages of all the subscales divided by three (total number of subscales). The final result, therefore, is expressed on a scale ranging from 0 to 100% and is directly proportional to the functional deterioration of the foot. The higher the score, the greater the functional alteration presented.

2.5. Statistical analysis

All statistical analyses were conducted using SPSS v. 24.0 (SPSS Inc., Chicago, IL, USA). Quantitative variables were reported using means and standard deviations. Categorical variables were reported by frequencies, cross-tabulations and descriptive analysis. Bivariate analysis was performed using the chi-square method for qualitative variables, and Student's t-test for quantitative variables.

The Kolmogorov-Smirnov test was used to measure normality, assuming a normal distribution with $p > 0.01$. The FFI was measured with non-parametric data. The median and the maximum and minimum (range) values were measured in the total sample. The Mann-Whitney *U* test was applied to assess differences between the case and control groups. A bivariate correlation test was applied to assess the relationship between the number of blisters and the FFI score.

3. Results

3.1. Sociodemographic variables and descriptive data

A total of 298 hikers, with 37 different nationalities, took part in the study. Of these, 141 (47.5%) were Spanish, 42 (14.1%) Italian, 17 (5.3%) American, 12 (4%) French and 11 (3.7%) German.

By sexes, 145 (48.7%) were male and 153 (51.3%) female. The mean age of the participants was 35.47 ± 13.75 years. Each had walked an average of 258.82 ± 209.47 km in the last 11.47 ± 9.36 days.

Table 1 shows the characteristics of the case and control groups. According to our bivariate analysis, only changing socks midway through the day's hike ($p = 0.04$) and making use of walking poles ($p < 0.001$) were significantly related to the presence of blisters.

3.2. Primary outcome measure

The primary outcomes – foot pain, disability and activity limitation – were assessed in both groups (see Table 2). Pain, disability and the final FFI score were all significantly higher in the case group (pain: case group 52.38 ± 22.76 vs control group 38.10 ± 23.44 p=< 0.001; disability: case group 30.43 ± 25.33 vs control group 22.22 ± 22.15 $p = 0.015$; final FFI score: case group 31.28 ± 18.43 vs control group 23.34 ± 16, 85 p=<0.001). However, there were no significant differences between the two groups in the limitation of physical activity ($p = 0.144$).

The subscale presenting the highest scores was pain, in the case group and in the control group (52.38 ± 22.76 vs 38.10 ± 23.44, respectively), followed by disability (30.43 ± 25.33 vs 22.22 ± 22.15, respectively). The activity limitation subscale presented the lowest scores, obtained by the following questions: Did you stay in the hostel all

Table 1
Quantitative sociodemographic and descriptive date for patients with foot blisters, no blisters and total sample.

Quantitative descriptive data	Total group (n = 298) Mean ± SD	Blistering (n = 207) Mean ± SD	No blistering (n = 91) Mean ± SD	p-value
Age (years)	35.47 ± 13.75	34.56 ± 13.30	37.57 ± 14.57	0.26
Weight (kg)	70.99 ± 13.67	71.45 ± 13.33	69.93 ± 14.45	0.54
BMI (kg/m^2)	23.91 ± 3.85	24.13 ± 3.62	23.49 ± 4.25	0.86
Total distance walked (km)	258.82 ± 209.47	265.31 ± 210.23	244.08 ± 208.13	0.59
Duration of hike (days)	11.47 ± 9.36	11.70 ± 9.30	10.97 ± 9.55	0.97
Weight of backpack (kg)	7.63 ± 2.72	7.78 ± 2.72	7.29 ± 2.69	0.61
Sex (male/female)	48.7/51.3	50.2/49.8	45.1/54.9	0.41
Smoker (Yes/No) %	22.3/77.7	23.9/76.1	18.7/81.3	0.30
History of podiatric treatment (Yes/No) %	21.6/78.4	21.8/78.2	21.1/78.9	0.96
Prior training for hike (Yes/No) %	66.7/33.3	65/35	70.3/29.7	0.37
Change socks during hike stage (Yes/No)	17.1/82.9	19.8/80.2	11/89	**0.04**
Apply hydrating cream during the hike stage (Yes/No)	48.3/51.7	50.2/49.8	44/56	0.32
New footwear (Yes/No)	35.7/64.3	36.9/63.1	33/67	0.51
Plantar orthoses (YES/NO)	8.1/91.9	7.7/92.3	8.8/91.2	0.75
Appropriate backpack weight (Yes/No)[a]	48/52	46.4/53.6	51.7/48.3	0.402
Use walking poles (Yes/No)	47.4/52.6	48.2/51.8	45.6/54.4	**<0.001**
Foot type				
Right foot (normal/supinated/pronated)	15.4/66.1/18.5	15.9/65.2/18.8	14.3/68.1/17.6	0.88
Left foot (normal/supinated/pronated)	15.1/68.8/16.1	14.5/68.6/16.9	16.5/69.2/14.3	0.80

Mann Whitney *U* test for independent samples was applied.
χ^2 test was applied. In all analyses, p<0.05 (95% confidence interval) was considered statistically significant.
[a] Considered correct when less than 10% of body weight.

Table 2
*S*cores obtained for the pain, disability and activity limitation subscales, and the overall score, for the case group vs. the control group.

Quantitative descriptive data	Total group (n = 298) Median ±SD (Range)	Blistering (n = 207) Median ±SD (Range)	No blistering (n = 91) Median ±SD (Range)	p-value
Pain	49.60 ± 23.60 (0–100)	52.38 ± 22.76 (0–98.41)	38.10 ± 23.44 (0–100)	<0.001
Disability	27.16 ± 24.63 (0–90.12)	30.43 ± 25.33 (0–90.12)	22.22 ± 22.15 (0–87.65)	0.015
Limitation of activity	11.11 ± 17.58 (0–77.78)	11.11 ± 18.38 (0–77.78)	10.00 ± 15.42 (0–60)	0.144
Total score	29.12 ± 18.30 (0–84.99)	31.28 ± 18.43 (0–84.99)	23.34 ± 16.85 (0–78.44)	<0.001

In all the analyses, p<0.05 (95% confidence interval) was considered statistically significant. The variables studied (FFI pain, disability, activity limitation and total score) do not follow a normal distribution at 95% significance, according to the Kolmogorov-Smirnov test. The Mann-Whitney *U* test was used to study the difference between the means in independent samples.

day because of problems with your feet?; Did you stay in bed all day because of foot problems?; Did you use walking aids (cane, crutch) inside the hostel?; Did you use assistive devices (cane, crutch) outside the hostel? And Was your activity limited because of foot problems?

Regarding the number of blisters on each foot, 96.8% of the injured hikers presented one or two lesions. Specifically, 34.3% presented a single lesion on the right foot, 17.8% had two lesions, 5.1% had three and 2.7% had more than three. 31.9% had a single blister on the left foot, 12.8% had two lesions, 4% had three and 2.3% had more than three (see Table 3).

The lesions were more frequently present on the right foot, especially on the tips of the toes (26.8%), the heels (25.2%) and the plantar area of the metatarsal heads (21.1%) (see Table 4).

Analysis of the scores obtained for the subscales, according to the number of blisters on each foot, showed there was no correlation in any case (pain: right foot r = 0.273, left foot r = 0.185; disability: right foot. r = 0.263, left foot r = 0.251, activity limitation: right foot r = 0.188, left foot r = 0.162, final score: right foot r = 0.294, left foot r = 0.245) (see Table 5).

The location of the lesion influenced foot functionality. The hikers with lesions on the metatarsal heads reported a higher FFI score (i.e., worse functionality) than those whose lesion was located elsewhere [right foot: 38.09 ± 18.72 (0–80.32) vs 29.79 ± 17.80 (0–85); left foot: 38.04 ± 20.28 (1.59–85) vs 29.98 ± 17.46 (0–82.01]. These lesions were the most limiting and caused more pain (right foot p = 0.009 left foot p = 0.017), greater disability (right foot p = 0.005; left foot p = 0.005), greater activity limitation (right foot p = 0.012), and higher FFI score (right foot p = 0.002, left foot p = 0.007). Heel injuries were significantly related to increased pain (right foot p = 0.003, left foot p = 0.016) and final score (right foot p = 0.010; left foot p = 0.026), but not to disability or activity limitation. There was no significant relationship between lesions on the tips of the toes and any of the FFI subscales (see Table 6).

4. Discussion

To our knowledge, this is the first study conducted to consider the relation between the presence of blisters on the foot and functionality. There was a significant association between pain and disability in the case group (hikers with blisters), compared to the control group (no blisters). However, in both groups pain was the subscale with the highest score, both in the case group and in the control group, so the presence of pain in the group of walkers without blisters was not related to disability.

As concerns the limitation of physical activity, there were no significant differences between the two groups, from which we conclude that, in general, this type of lesion does not limit physical activity. On the other hand, Knapik et al. identified blisters as one of the main causes of decreased performance and abandonment in sports competitions [24]. Hoffman and Fogard reported that 40.1% of finishers of competitive single-stage ultramarathons cited friction blisters as producing an adverse effect on performance [16]. Our own study shows this lesion to be one of the possible causes of hikers' abandoning their route or interrupting it until the pain and discomfort decrease.

Although this study does not address the cost of healthcare, blisters

Table 3
Number of blisters found on each foot.

Total blisters (n)	Right foot n (%)	Left foot n (%)
0	119 (40.1)	146 (49)
1	102 (34.3)	95 (31.9)
2	53 (17.8)	38 (12.8)
3	15 (5.1)	12 (4)
4	6 (2)	5 (1.7)
5	2 (0.7)	1 (0.3)
6	–	1 (0.3)

Table 4
Location of blisters found on each foot.

Blister location	Right foot n (%)	Left foot n (%)
Subungual	9 (3)	7 (2.3)
Tips of the toes	80 (26.8)	66 (22.1)
Upper part of the toes	18 (6)	14 (4.7)
Metatarsal head	63 (21.1)	58 (19.5)
Heel	75 (25.2)	55 (18.5)
Internal arch	4 (1.3)	1 (0.3)

can also represent a significant health expense, since not all such injuries can be self-treated; in some cases, they require specialist care, as studies have shown that the pain (sensory and afferent) provoked by keratotic blisters can be significantly reduced by scalpel debridement [40,41]. A study of recruits to the US Marine Corps estimated that friction blisters caused an annual cost of 690,000 dollars [15]. While we are unaware of the financial consequences of blister lesions to hikers on the Camino de Santiago, it can be assumed that any injury requiring treatment will be preceded by great discomfort to the hiker and in some cases by lack of access to health care, injuries could worsen, this aspect should be studied in future research.

Among the case group, the right foot was more often affected, and presented a greater number of blisters, than the left, probably because it is usually the dominant foot; however, the difference was not statistically significant. This finding is in line with Chicharro et al. [4].

The most frequent location of blistering, for both feet, was the tips of the toes, followed by the heels, the metatarsal heads and, lastly, the dorsal area of the toes, coinciding with the most common locations also reported in the above study [4], i.e., beneath the metatarsal head of the first or second metatarsal and the fifth toe. The regions presenting the fewest blisters were the internal arch and the subungual area (beneath the toenails). Analysis of each foot separately revealed that on the left foot more blisters were located on the metatarsal heads than on the heel, in contrast to the right foot, where there were more blisters on the heel than on the metatarsal heads.

The precise location of the blisters had a significant influence on pain, disability and limitation of physical activity. The locations reported as being most painful and producing greatest disability were the metatarsal area, followed by the heel and, lastly, the tips of the toes.

However, the number of blisters was not significantly related to the subscale scores for pain or activity limitation, or to the final score for both feet.

Our study sample presented a high rate of blistering, corroborating previous investigations of long-distance hikers and backpackers, which have reported blistering rates of 54–86% [12,13], of military personnel (5–77%) [14,15] and of athletes performing ultramarathons and adventure running (26–76%) [16,17].

Foot blisters are said to be the most common medical complaint affecting hikers [42] and ultramarathon/adventure runners [43–45]. Although they are often considered a minor injury, the pain experienced can cause the hiker to adopt an antalgic gait, limping and even overloading the contralateral limb, which can lead to another injury. Bush et al. [15] found that 11.2% of recruits had a blister before reporting a second lower extremity injury, suggesting that the presence of a blister could be a risk factor for subsequent musculoskeletal injuries. The impact of friction blisters, as reflected in this study, is not insignificant, as it affects foot functionality in terms of pain, disability and, to a lesser extent, the limitation of physical activity.

4.1. Limitations

The present study is subject to certain limitations, especially the relatively small sample considered. Nevertheless, it was evenly balanced between the sexes and represented a wide range of nationalities, thus providing quite heterogeneous information when considering different genders, ages and nationalities. In the future, it would be interesting to analyse a larger number of subjects, both those with bullous lesions and in the control group.

Another limitation is that the data were collected at a single point along the route. Some hikers had been walking for longer than others, so the blisters assessed had evolved to different degrees, a variation that might have distorted the FFI results. Consequently, in future investigations, it would be useful to compare the FFI values obtained by hikers with recent-onset vs. long-standing blisters.

There are still many issues pending to be resolved, however, this study makes it clear that the presence of blisters affects the functionality of the foot, so from a medical point of view, it would be necessary to influence hikers and dedicate resources to the prevention of these injuries.

5. Conclusion

The hikers who presented blisters experienced an evident reduction in foot functionality, in terms of pain and disability, although physical activity was not significantly restricted, compared to those with no blisters. However, a greater number of blisters was not associated with worsened foot functionality. The lesions on the metatarsal heads caused more pain, disability and limitation of activity than those located elsewhere.

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Table 5
Scores on the subscales for pain, disability, activity limitation, and the overall score, according to the number of lesions found on each foot.

Number of lesions	Pain		Disability		Activity limitation		Overall score	
	Right foot Mean ± SD (range)	Left foot Mean ± SD (range)	Right foot Mean ± SD (range)	Left foot Mean ± SD (range)	Right foot Mean ± SD (range)	Left foot Mean ± SD (range)	Right foot Mean ± SD (range)	Left foot Mean ± SD (range)
1	47.26 ± 23.23 (0–92.06)	49.15 ± 22.07 (0–92.06)	31.66 ± 25.80 (0–88.89))	33.36 ± 23.99 (0–88.89)	15.71 ± 17.45 (0–71.11)	17.74 ± 19.88 (0–77.78)	31.54 ± 18.53 (0–85)	33.58 ± 17.78 (0–82.01)
2	55.89 ± 20.62 (7.93–90.48)	59.82 ± 23.40 (4.76–100)	41.61 ± 25.03 (0–82.72)	45.92 ± 28.70 (0–90.12)	18.44 ± 19.79 (0–75.56)	22.70 ± 21.83 (0–75.56)	38.65 ± 17.71 (5.52–74.57)	42.82 ± 20.72 (1.59–84.99)
3	52.18 ± 22.75 (0–80.95)	43.19 ± 23.19 (0–88.89)	43.62 ± 25.90 (5–87.65)	38.52 ± 30.45 (0–88.89)	23.92 ± 17.86 (0–57.78)	13.32 ± 15.63 (0–46.67)	39.91 ± 15.45 (10.88–71.35)	31.67 ± 16.02 (10.8–59.42)
4	65.29 ± 20.62 (36.98–100)	57.87 ± 13.36 (44.4–79.37)	50.20 ± 19.65 (20.99–75.31)	45.44 ± 26.78 (5–66.67)	22.53 ± 23.51 (0–60)	16.60 ± 15.73 (0–42.22)	46.01 ± 19.20 (20.22–78.44)	39.97 ± 16.40 (21.6–61.11)
5	65.29 ± 20.62 (52–79.37)	60.31	48.06 ± 19.32 (34.40–61.73)	49.38	24.41 ± 25.18 (6.60–42.22)	15.56	46.05 ± 21.28 (31–61.11)	41.79
6	–	28	–	64.19	–	40	–	44.06
P value	<.001	0.001	<.001	<.001	0.001	0.005	<.001	<.001
r*	0.273	0.185	0.263	0.251	0.188	0.162	0.294	0.245

*Pearson's bivariate correlation test. The correlation is assumed to be significant at 0.001 level (bilateral).

Table 6
Scores on the subscales for pain, disability, activity limitation, and the overall score, according to the location of the lesions on each foot.

Location of the lesions		Right foot: Pain Mean ± SD (range)		Disability.Mean ± SD (range)		Activity limitation Mean ± SD (range))		Overall score Mean ± SD (range)		Left foot: Pain Mean ± SD (range)		Disability.Mean ± SD (range)		Activity limitation Mean ± SD (range))		Overall score Mean ± SD (range)	
Tips of the toes	Yes	50.17 ± 21.38 (0–93.65)	p= 0.203	36.54 ± 24.93 (0–87.65)	p = 0.072	17.95 ± 18.25 (0–75.56)	p = 0.105	34.89 ± 17.53 (3.7–84.99)	**p=0.046**	49.49 ± 22.54 (0–98.41)	p = 0.242	37.11 ± 26.45 (0–88.89)	p = 0.101	17.65 ± 19.52 (0–77.78)	p = 0.303	35.01 ± 18.28 (0–82.01)	p = 0.061
	No	45.28 ± 24.25 (0–100)		31.02 ± 24.41 (0–90.12)		14.60 ± 17.28 (0–77.78)		30.36 ± 18.45 (0–82.01)		45.75 ± 23.86 (0–100)		31.15 ± 23.97 (0–90.12)		14.86 ± 16.97 (0–71.11)		30.58 ± 18.22 (0–85)	
Metatarsal head	Yes	53.06 ± 21.67 (0–100)	**p=0.009**	40.93 ± 26.84 (0–88.89)	**p=0.005**	20.28 ± 19.26 (0–71.11)	**p=0.012**	38.09 ± 18.72 (0–80.32)	**p=0.002**	53.14 ± 23.43 (0–100)	**p=0.017**	42.28 ± 28.63 (0–90.12)	**p=0.005**	14.69 ± 16.80 (0–77.78)	p = 0.297	38.04 ± 20.28 (1.59–85)	**p=0.007**
	No	44.82 ± 23.76 (0–98.41)		30.20 ± 23.54 (0–90.12)		14.18 ± 16.90 (0–77.78)		29.79 ± 17.80 (0–85)		44.97 ± 23.4 (0–93.65)		30.09 ± 23 (3–88.90)		18.71 ± 20.27 (0–71.11)		29.98 ± 17.46 (0–82.01)	
Heel	Yes	53.36 ± 23.22 (0–100)	**p=0.003**	37.21 ± 25.52 (0–88.89)	p = 0.062	18.79 ± 19.67 (0–75.56)	p = 0.084	36.44 ± 18.65 (0–82.01)	**p=0.010**	53.86 ± 21.81 (0–100)	**p=0.016**	38.10 ± 25 (0–90.12)	p = 0.050	19.46 ± 20.04 (0–66.67)	p = 0.098	37.14 ± 19.53 (0–82.01)	**p=0.026**
	No	44.27 ± 23.32 (0–98.41)		30.87 ± 24.16 (0–90.12)		14.36 ± 16.70 (0–77.78)		29.89 ± 17.91 (0–85)		44.91 ± 23.71 (0–98.41)		31.19 ± 24.41 (0–88.89)		14.57 ± 16.88 (0–77.78)		30.28 ± 17.79 (0–85)	

The Mann-Whitney *U* test was used to study the difference between the means in independent samples. In all analyses, p<0.05 (95% confidence interval) was considered statistically significant.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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