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A Comparison of Two Sock Types on Navicular Drop and Center of Pressure Measurements in Standing, Walking, and Running

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A Comparison of Two Sock Types on Navicular Drop and Center of Pressure

Measurements in Standing, Walking, and Running

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ABSTRACT

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Introduction: The New Balance Core Low Cut Sock (New Balance Athletic Shoe, Inc. · Boston, MA United States) is one of many arch support socks out in the market. These socks have an elastic portion, called a Stability Fit Arch Support & Hold technology, which has been incorporated into the arch area of the sock. The company makes the following claim that the socks provide, "Gentle compression to support the arch, relieving arch-related pain and discomfort."[1] If these socks do provide adequate arch support, then they would allow individuals the ability to have an inexpensive method of arch support that is easy to apply and use. The purpose of this study is to test the effectiveness of these socks in (a) navicular drop (b) static pressure insole pressure profiles and (c) dynamic (walking and running) pressure insole pressure profiles. **Methods:** Eighteen symptomatic, college age (age 18-26) subjects were used in this study (seven male, eleven female), with symptomatic being defined as a navicular drop greater than or equal to 10 mm**.** Measurements were collected for both the navicular drop, and F-Scan insole data, for both static and dynamic stance. For walking and running trials, heel strike and toe off were identified by the Tekscan System and COP excursion coordinates evaluated throughout the stance phase. The COP coordinates were exported then compared over the stance phase. A series of functional analyses was used to assess the between group differences. A paired t-test was used to assess the within group differences. **Results:** Results indicate that the arch support socks were not significantly different from the control (regular socks) along any part of the foot strike (95% confidence) in any of the conditions (standing, walking or running). Results from the paired t-test revealed no significant differences in navicular drop between sock types ($p = .379$). **Discussion:** This study found that the elastic band in the New Balance socks did not provide increased support to the medial arch of the foot compared to the control sock in either the navicular drop paired t-test or the functional analysis of the static and dynamic data. The authors could not find any other comparable study on these kinds of socks. Compared to other reports, using both orthotic inserts and tape, ND was reduced, unlike the results found in the present study.[2] Our data are inconsistent with the idea that increased elastic support to the midfoot by these socks provides significant arch support. The authors would suggest another form of arch support such as orthotics or taping to aid on arch support rather than these socks.

Keywords: medial tibial stress syndrome, socks, tibialis posterior, shin splints

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Introduction

Injuries can be categorized into two groups according to the time frame in which they occur: acute and chronic. Acute injury is injury that is of rapid onset and progression, but of a limited duration.[3] Acute injuries are usually the result of a specific impact or traumatic event to the body.[3] Chronic injuries, or overuse injuries, develop slowly, persist, and are often the result of repetitive stress to the various tissues of the body, without proper time for healing.[4] Chronic injuries often occur from either an anatomical or biomechanical abnormality that causes excess stress to be placed on the body's structures. Most occur in the lower extremity, especially the lower leg and foot, with the arch[5] being a place of particular interest to this study.

The foot is a complex architectural structure that requires many anatomical components to maintain its weight bearing and force transmitting capabilities. Most salient to this study is the muscular support provided by the tibialis posterior (TP) and tibialis anterior (TA), which insert on the navicular and assist in maintaining the arch by providing an upward pull.[6]

When these supporting structures fail (i.e. the TP and TA resulting in a fallen arch), certain injuries may appear including plantar fasciitis[7], Achilles tendonitis[8], and TP tendonitis.[8] To prevent these failures several therapeutic and mechanical interventions have been produced. Most salient to this study are mechanical interventions created for the foot and arch, such as: custom orthotic inserts, various taping techniques, and night splints. Research has shown that flat arched foot postured individuals had an increase in EMG activity while walking in the TP and TA, than compared to those with a normal arch foot posture.[9] This indicates that these muscles are longer activated in those individuals who have a flat arch. It has been shown that both taping[10] and orthotics[11] helps to decrease the EMG activity of the TP during walking. This is yet another indication of the beneficial effects of arch support.

Orthotics which can vary from custom to over the counter are designed to, "control, stabilize, support, or correct flexible deformities".[12] Another benefit to orthotics is that they are rigid or semi rigid and could thus provide a firm support to the arch; though a downside with this intervention is that the initial start-up cost can be expensive.

Taping also supports the arch by preventing excess calcaneal eversion, which leads to a reduction in the amount of pronation and stabilizing the arch.[13] Taping the arch of the foot, specifically the low dye[14] and modified low dye[15], is done by applying strips of tape both on the plantar surface of the foot, as well as circumferentially around the arch.[10] In these taping procedures the tape is pulled at specific points to provide additional support to the arch.[10] Unfortunately taping requires another person to apply the tape, leaving this intervention more difficult to employ. Also the cost over time could possibly become expensive.

More recently arch support socks have become popular in the active population. The New Balance Core Low Cut Sock (New Balance Athletic Shoe, Inc. · Boston, MA United States) is designated as one of the arch support socks produced by the company. These socks have an elastic portion that has been incorporated into the arch area of the sock. New Balance uses a Stability Fit Arch Support & Hold technology in the majority of their socks. The company makes the following claim, "Gentle compression to support the arch, relieving arch-related pain and discomfort."[1] The support given by these socks can be quantified through the use of the center of pressure (COP) and navicular drop (ND) measurements. The COP shows the spatial relationship between pressure distribution and the entire plantar surface of the foot.[16] The more support provided to the arch, the less the navicular bone will drop. If these socks do provide adequate arch support, then they would allow individuals the ability to have an inexpensive method of arch support that is easy to apply and use.

The purpose of this study is to test the effectiveness of the New Balance Core Low Cut Sock compared to the Hanes Men's and Women's Classics Cushion Low Cut socks. The authors are looking for; (a) a decrease in navicular drop (b) a lateral shift in static pressure insole pressure profiles and (c) a lateral shift in dynamic (walking and running) pressure insole pressure profiles. The Hanes socks were selected because they are of similar thickness to the New Balance socks, and New Balance does not make comparable socks without arch support.

Methods

Design

This is a single factor (sock type: arch support, non-arch support) controlled laboratory study design with all participants acting as their own controls.

Independent and Dependent Variables

The independent variable is the sock type (arch-support sock, non arch support sock). Since this study only includes an adult physically active population, the generalizability of the results will be limited to a population of similar age and fitness level. The dependent variables include time, vertical difference in navicular height measured in mm and, F-Scan COP lines, over three conditions (standing, walking and running).

Participants

Eighteen symptomatic, college age (age 18-26) subjects were used in this study (seven male, eleven female), with symptomatic being defined as a navicular drop greater than or equal to 10 mm as defined by Sell et al.[17] All participants were physically active (exercising a minimum of 3 times a week for 30 minutes), ambulatory and free from lower-leg injury or pain within the previous month. Previous history was determined from participant's responses in the history questionnaire (Appendix A). All participants gave informed consent. All procedures received university IRB approval. Participants were recruited via classroom announcements and personal invitation.

Instrumentation

Navicular drop was determined with a ruler, index card, and pen, according to DeLacerda.[18] This method has been proven to be a valid and reliable intra-tester measure according Mueller et al.[19]

F-Scan insoles (Tekscan Inc., Boston, MA) are pressure sensors with 3.9 sensels per cm^2 that measure plantar pressures and compute COP. The sampling rate of these insoles was set to 200 Hz. Each pressure sensor was custom fit to the shoes. F-Scan software (Research version 6.31; Tekscan, Inc., Boston, MA) was used to record the plantar pressures measured during static and dynamic trials for all subjects. The COP excursion was evaluated using this software.

A Quinton Q65 Series 90 Treadmill (Quinton Instrument Co., Bothell, WA, U.S.A.) was used for this experiment. This was done shod with the subjects using the Nike T-Lite shoe for testing. Prior to testing, the insoles of the Nike T-Lite shoe were replaced by the F-Scan pressure insole where double sided tape was be used to adhere the insole to the shoe to prevent slipping. The F-Scan pressure insoles were calibrated according to the manufacturer's directions while the subject was wearing the shoes.

Procedures

In advance of the proposed study, preliminary trials were conducted to refine and standardize all study procedures. New Balance Core socks were selected for use in this study due to manufacturer's claims of lifting and supporting the arch. The primary researcher, spent time sufficient to refine all study procedures such as testing procedures using the TekScan technologies, data collection procedures, and data reduction techniques (all study procedures involving the software are listed in appendix B).

Measurements

Measurements were collected for both the navicular drop, and F-Scan insole data, for both static and dynamic stance. The navicular drop was tested on the subject's dominant foot according to the following procedure reported by DeLacerda[18] however with a slight modification using socks instead of barefoot. The subject was placed in a partial-weight bearing position, sitting with both feet on the floor. The tester palpated each foot to find the navicular prominence. Using a pen, the tester marked on the subject's sock at the point of the navicular prominence. This landmark was also continuously palpated in order to account for shifting of the socks. This allowed the tester to have both a visual and tactile method that would allow for a more accurate reading. Next, the tester stood the card on the floor next to the medial arch of the foot and marked the card at the level of the navicular prominence. The subject then stood. Once the arch was weight bearing, the tester then made a second mark on the same side of the card at the new level of the navicular prominence. If the difference was greater than 10 mm it was considered symptomatic.[17]

Intervention

The arch support sock, and non-arch support sock order were randomly assigned by flipping a coin. Subjects reported to the lab wearing shorts. Data were collected over one 45-minute session by the primary researcher as follows:

Upon arrival at the testing facility, participants filled out a survey designed to collect demographic and other pertinent data (e.g., height, weight, history, activity patterns, etc.).

1. Data specific to the pressure insole software were entered into the computer (e.g. weight and gender).
2. Subjects completed a warm up consisting of five minutes of walking at their selected pace and then the tester increased the treadmill speed to 2.99 m/s for three additional minutes.
3. Next, participants were given one of the two sock types, and were instructed how to put on the sock. This was to ensure that the seam of the toe was lined up along the superior aspect of the tips of the toes, and the heel in the heel portion of the sock.
4. After the sock was placed correctly on the participant he or she was measured on their dominant foot with respect to navicular drop (average of three measurements).
5. Participants then put on the shoes with the insole in-place. Shoes were put on with care so as not to alter the placement of the insole. They were also tied snugly so as to minimize foot movement inside the shoe.
6. Standing pressure insole measurements were then taken. A double leg stance was recorded for 3 trials, each lasting 30 seconds. Fifteen seconds of rest was given in-between each trial. The subject had their hands on their hips; their eyes open looking straight ahead.
7. The participants stepped on to the treadmill and walked at a speed of 1.34 m/s at a 0% grade for 10 strides then increased to a speed of 3.35 m/s at a 0% grade for 2 additional minutes plus the length of time it took for the subject to complete 10 strides. The F-Scan was continuously recording during the 10 strides of walking and running.

8. The subject then carefully removed the shoes and replaced their socks with a new pair given according to the directions in step 3. They then were taken through steps 4 through 8 in the new socks.

The two socks that were used are the New Balance Core Sock and the Men's and Women's Hanes Low-Cut Sock. Both socks are low-cut and have extra cushion in the ball and heel of the sock. The New Balance sock has an additional support built into the arch, while the Hanes socks do not have additional support.

Data Collection and Analysis

Demographic data (height, weight, health, physical activity level, use of orthotics, lower limb surgery/therapy/injury, etc.) were collected via an initial questionnaire. Inclusion criteria included a navicular drop of greater than or equal to 10 millimeters on the dominant foot, physically active, and between the ages of 18-26. Exclusion criteria includes those having had lower limb or foot surgery in the last year, those having had lower limb or foot physical therapy in the last six months, and those having had a lower leg or foot injury in the last month.

Data Analysis. For walking and running trials, heel strike and toe off were identified by the Tekscan System and COP excursion coordinates evaluated throughout the stance phase. The COP coordinates were exported then compared over the stance phase. A series of functional analyses was used to assess the between group differences (sock type) as a polynomial function rather than a discrete data point allowing for an observation of where differences exist during stance. All data were computed to examine means, standard deviations, frequencies, etc. A paired t-test was used for navicular drop evaluation of the 2 groups.

Results

Data were collected for 21 subjects, but three subject's data were determined to be unusable due to a system error during data collection and taken out of the analysis.

Demographic data (height, weight, physical activity level, uses of orthotics, lower limb surgery/therapy/injury, gender, etc.) were collected via an initial questionnaire. Descriptive data were computed to examine means, standard deviations, frequencies, etc. Descriptive data for all participants are listed in Table 1.

The independent variables are the sock type (New Balance and control) and time (standing, walking and running). Raw, dependent variable data points for each of 18 participants were generated by three navicular height measurements per condition (n=108) and 2 standing, 10 walking and 10 running stance TekScan images per condition (n=792).

Navicular drop. All ND data were inputed into SPSS. A paired t-test revealed no significant differences in ND between sock types ($p = .379$). Means and standard deviations for both sock types are found in Table 2.

Multivariate analysis of lateral shift as a function of time. A multivariate functional (lateral shift as a function of time) analysis was used to assess the between group (sock types) differences. This analysis observed the stance phase as a polynomial function rather than a discrete data point, allowing for an observation of where differences exist during the entire duration of the stance phase. Traditional analysis of variance statistical methods would require an examination of lateral shift at a specified point during the stance phase. Using multivariate analysis of variance, also known as a functional analysis, examination of lateral shift can be accomplished at many different time points simultaneously. However, if the functional nature of the data is preserved (i.e., examining lateral shift as a function of time), all data will be able to be used and more interpretable results found. Hence, the lateral shift was used as a function of time as the response variable. Using functional analysis of variance, the mean lateral shift was examined for each condition. The functional data analysis methods were used to determine which parts of the stance interval are significantly different in lateral shift between conditions.

Transforming and normalizing lateral shift data. First, it was necessary to transform the lateral shift data into actual functions using cubic smoothing splines[20]. Next, these functions were normalized to have the same end points using linear warping functions. This normalizing procedure accounts for amplitude variation in the functions due to individual differences in foot size or stance phase duration[20]. With the functions normalized, altitude variation in the functions was analyzed to determine if there were any statistically significant differences from the zero function in lateral shift throughout the stance phase (i.e., as a function of time) across all 3 conditions. Figures 1-6 are a visual representation of how the data were normalized in all three conditions using the linear warping function[20]. Figures 7, 9, and 11 are visual representations of the controls in the standing, walking, and running trials. Figures 8, 10, and 12 are the visual representation of the functional analysis at each condition. The functional analysis to determine lateral shift of the COP is interpreted as follows: The black line in the center of the shaded area shows the mean difference in lateral shift (except on the control, where it is the mean lateral shift). The shaded area is the 95% confidence area. Accordingly, if the confidence area contains the red dotted line at 0, the mean difference function is not significantly different from 0 (or the 0 function), meaning that the lateral shift for the given treatment (arch support socks) is not significantly different from the control (regular socks). Results indicate that the arch support socks were not significantly different from the control (regular socks) along any part of the foot strike (95% confidence) in any of the conditions (standing, walking or running).

Discussion

The purpose of this study was to test the effectiveness of the New Balance Core Low Cut Sock and their claim that it provides "gentle compression to support the arch relieving arch-related pain and discomfort" by measuring (a) navicular drop, (b) static pressure insole pressure profiles, and (c) dynamic (walking and running) pressure insole pressure profiles. These measurements provided an assessment of the sock's ability to maintain arch support during static stance and the stance phase of walking and running. The sock's supposed compression is provided by an extra band of elastic at the midfoot of the sock.

This study found that the elastic band in the New Balance socks did not provide increased support to the medial arch of the foot compared to the control sock in either the navicular drop paired t-test or the functional analysis of the static and dynamic data. The authors could not find any other comparable study on these kinds of socks. Compared to other reports, using both orthotic inserts and tape, ND was reduced, unlike the results found in the present study.[2] Our data are inconsistent with the idea that increased elastic support to the midfoot by these socks provides significant arch support.

This was the first study using this method of the F-Scan insole system for testing socks. A study conducted by Prusak et al.,[21] tested two tape techniques with the F-Scan mat and found results indicating that a functional analysis can show changes in lateral excursion of the foot during standing and walking trials. Given New Balance's claims, it was expected that there would be an increase in lateral shift in the COP line in the arch support socks during gait, but the results indicated no difference between groups. The COP shows the spatial relationship between pressure distribution and the entire plantar surface of the foot.[16] A significant lateral shift would indicate that the arch support socks did support the medial longitudinal arch.

The company claims that the support given from the arch support socks is provided by an extra band of elastic woven into the arch of the sock. This band does not adequately compress or lift the arch to provide support for changes in COP or ND.

Research has shown that individuals with a flat arched foot posture have and increase in TP and TA EMG activity while walking, than compared to those with a normal arch foot posture.[9] It has been shown that both taping[10] and orthotics[11] helps to decrease the EMG activity of the TP during walking. This is an indication of the beneficial effects of arch support. Further research involving muscle activity should be done to determine the effects of these socks on more than just structural changes, that were looked at in this study.

The most frequently used arch support mechanisms are orthotics and taping procedures.[22] Orthotics provide arch support by raising the floor up to a neutral arch and limiting abnormal pronation.[23,24] This abnormal pronation is prevented by controling abnormal movement in the forefoot and hindfoot.[25] Arch support socks only provide support around the midfoot, which does not limit the movement in any part of the foot, but rather provides comfort via the compression to the area. However, this compression comfort may be misleading to users, due to the lack of significant arch support provided by these socks as found in our results.

This study does have several strengths and limitations, and further research may be needed to see if these socks may be helpful in other circumstances. One strength is that the authors used two methods of testing, navicular drop and center of pressure. All testing procedures were completed by the same tester and all subjects were their own control.

Some limitations include; only subjects with pes planus were used in this study, only a small population was tested. Also, data were only collected from three conditions: standing, walking, and running. Lateral movements were not considered such as cutting or sidestepping.

Only one arch support sock was tested. Other brands may also be worth exploring. Also, no other method of arch support was used either in conjunction with the socks or in comparison to the socks. This may be worth exploring for supplemental support as the tape loosens over time.[26] The subjects in the study were only from a physically active, college age population.

Conclusion

In conclusion, the New Balance Core Low Cut Sock did not provide any statistically significant support to reduce the navicular drop or change the static or dynamic pressure insole pressure profiles. The authors would suggest another form of arch support such as orthotics or taping to aid on arch support rather than these socks.

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Table 1: Descriptive Data for 18 included subjects. Means and standard deviation included.

Subject	Gender	Age	Mass(kg)	Height	Physical Activity
1	F	21	65.68	1.67	5
2	F	22	59.36	1.51	3
3	M	26	82.36	2.09	3
5	F	25	81.18	2.06	6
6	F	23	78.77	2.00	4
7	F	20	63.50	1.61	4
8	F	24	63.14	1.60	3
9	F	25	80.41	2.04	5
10	F	19	78.77	2.00	3
11	F	21	63.64	1.62	5
12	M	24	89.59	2.28	4
13	F	21	62.77	1.59	3
14	F	23	61.64	1.57	5
15	M	18	90.45	2.30	3
16	M	22	54.09	1.37	3
19	M	22	85.45	2.17	3
20	M	22	84.55	2.15	4
21	M	23	75.45	1.92	3
		M=22.28	*M*=73.38	*M*=1.86	*M*=3.83
		SD=2.11	*SD*=11.51	*SD*=0.29	*SD*=0.99

Table 2: Navicular Drop Paired Samples t-test Statistics in mm

	Mean	N	Standard Deviation	Std. Error Mean
Arch Support Socks	11.31	18	2.76	0.65
Regular Socks	10.72	18	1.53	0.362

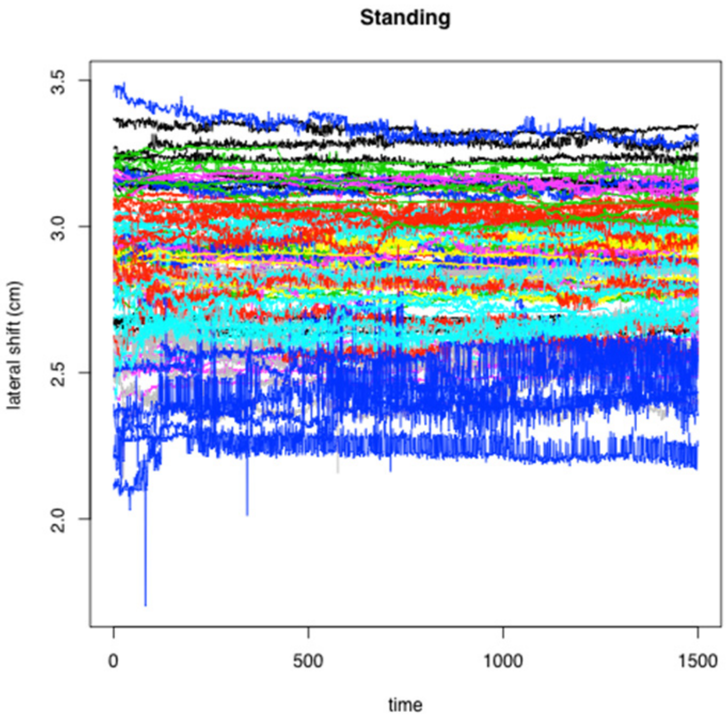

Figure 1: Pre-normalized spaghetti plot for standing trials by individual for COP data. Individual lines represent each of three trials per condition. Different colors represent each participant.

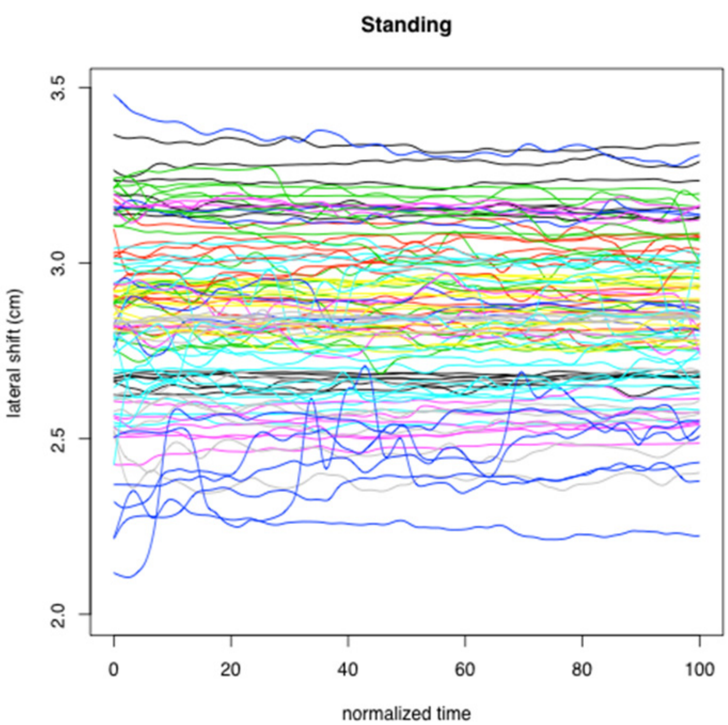

Figure 2: Normalized spaghetti plot for standing trials by individual for COP data, Normalizing the data removes individual differences due to foot size.

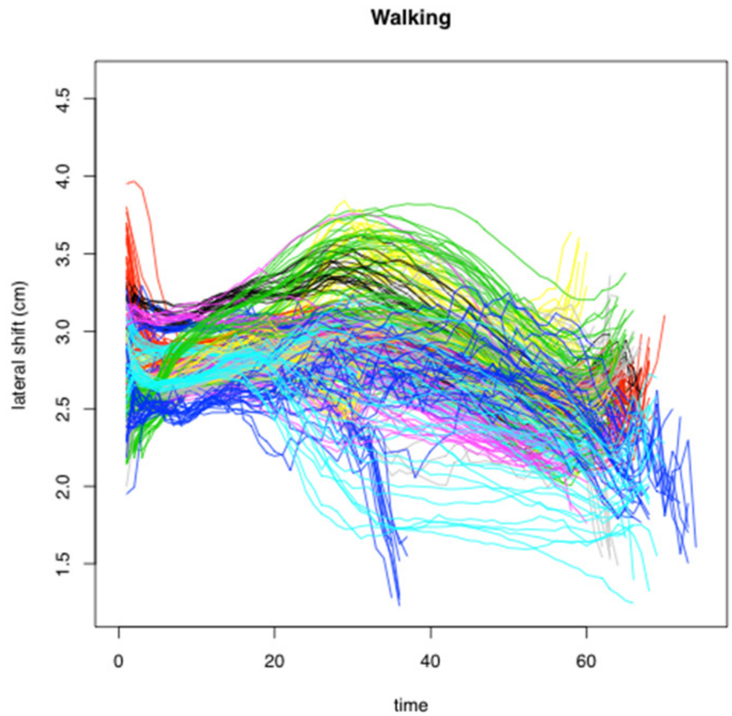

Figure 3: Pre-normalized spaghetti plot for walking trials by individual for COP data. Individual lines represent each of 10 trials per condition. Different colors represent each participant.

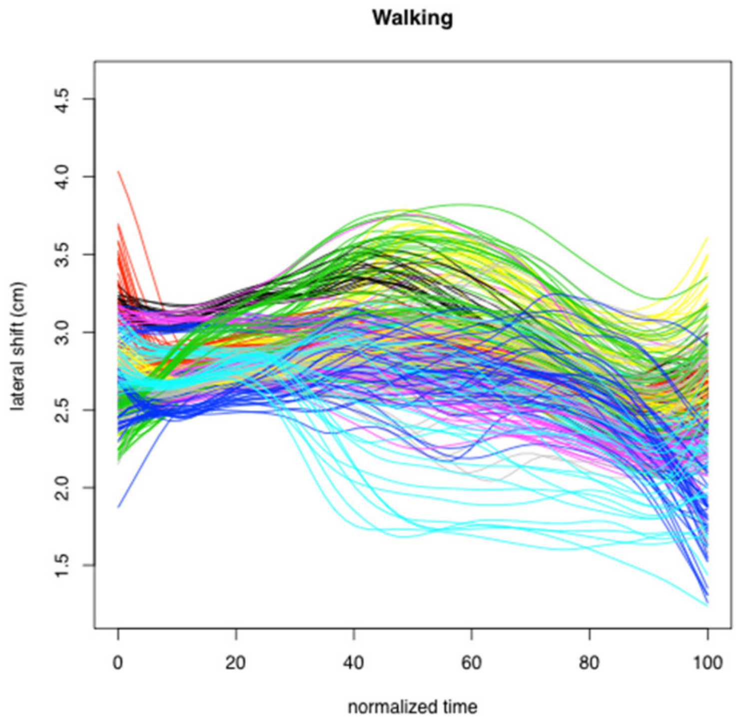

Figure 4: Normalized spaghetti plot for walking trials by individual COP data. Individual lines represent each of 10 trials per condition. Normalizing the data removes individual differences due to foot size and stance phase duration.

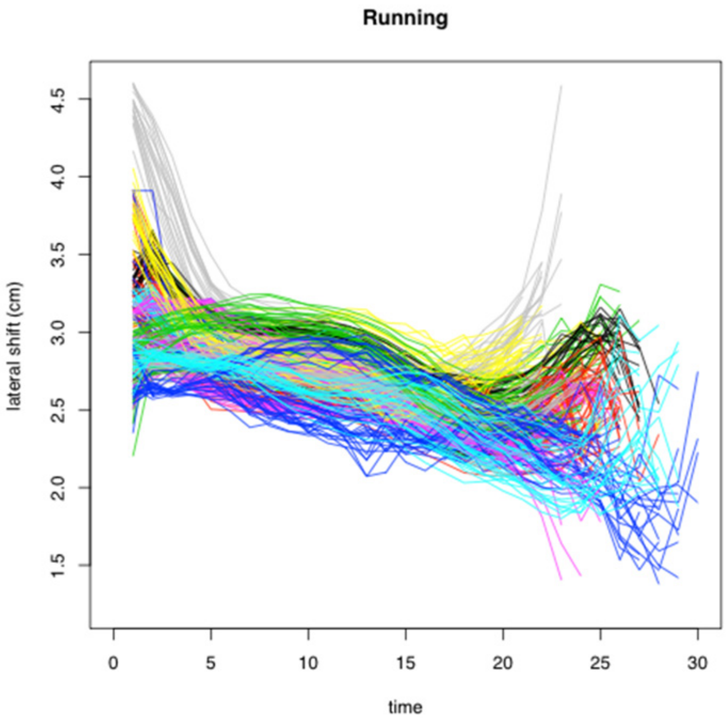

Figure 5: Pre-normalized spaghetti plot for running trials by individual COP Data. Individual lines represent each of 10 trials per condition. Different colors represent each participant.

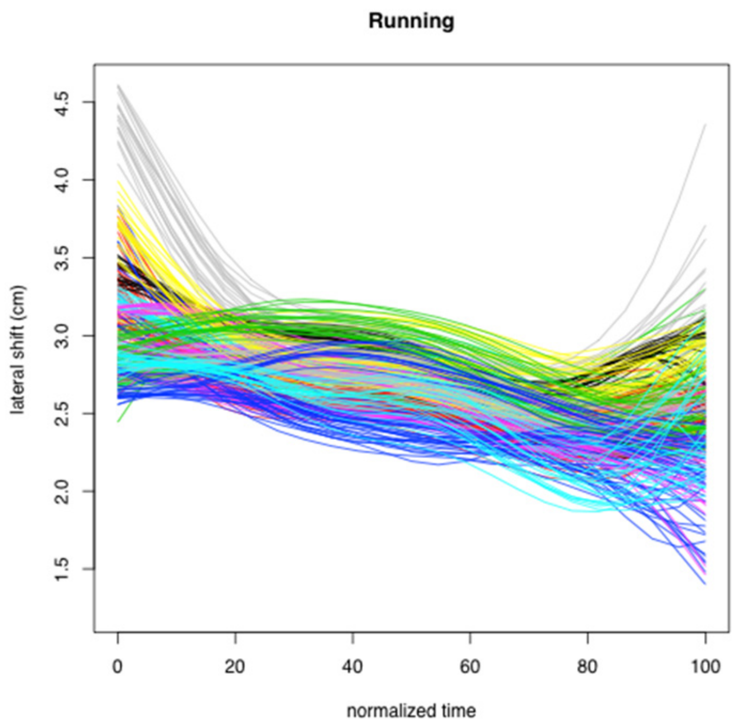

Figure 6: Normalized spaghetti plot for running trials by individual COP data. Individual lines represent each of 10 trials per condition. Normalizing the data removes individual differences due to foot size and stance phase duration.

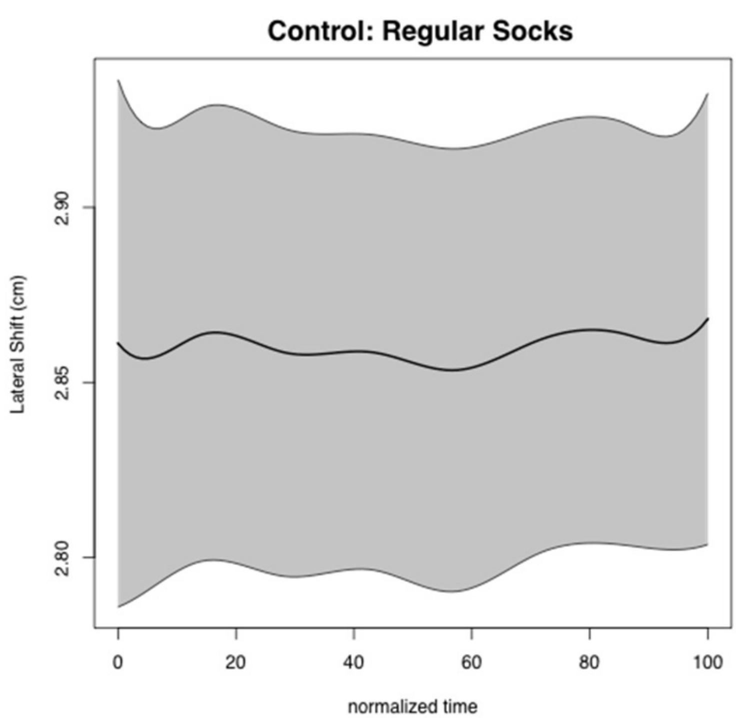

Figure 7: Functional Analysis of the control: Regular Socks. Standing trials.

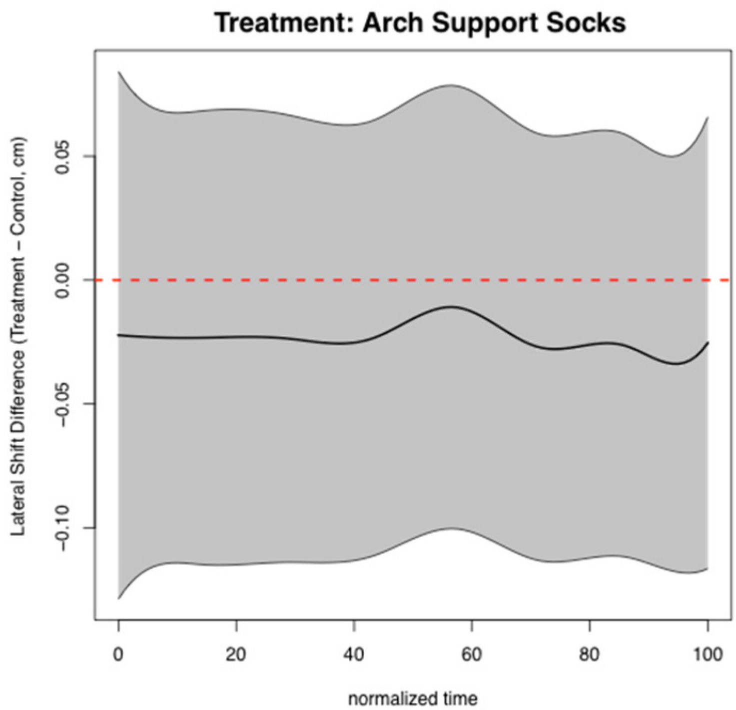

Figure 8: Functional analysis arch support socks standing trials. Comparing the arch support socks to regular socks shows that the mean difference (treatment minus control) function is negative, but that the 95% confidence intervals for this function span zero. The black line in the center of the shaded area shows the mean difference in lateral shift (except on the control, where it is the mean lateral shift). The shaded area is the 95% confidence area. Accordingly, if the confidence area contains the red dotted line at 0, the mean difference function is not significantly different from 0 (or the 0 function), meaning that the lateral shift for the given treatment (arch support socks) is not significantly different from the control (regular socks). Thus, we cannot conclude that there is a significant difference between arch support socks and regular socks at the 5% level.

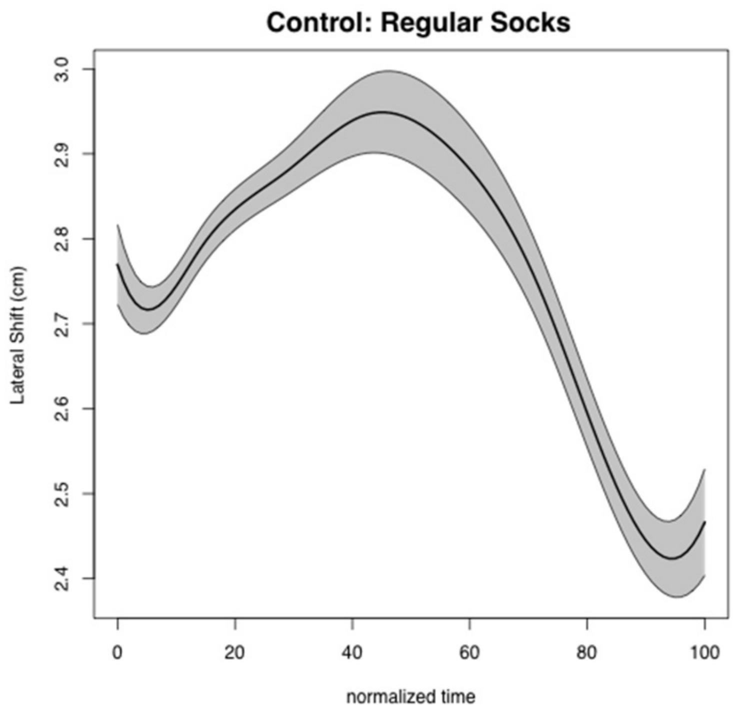

Figure 9: Functional Analysis of the control: Regular Socks. Walking trials.

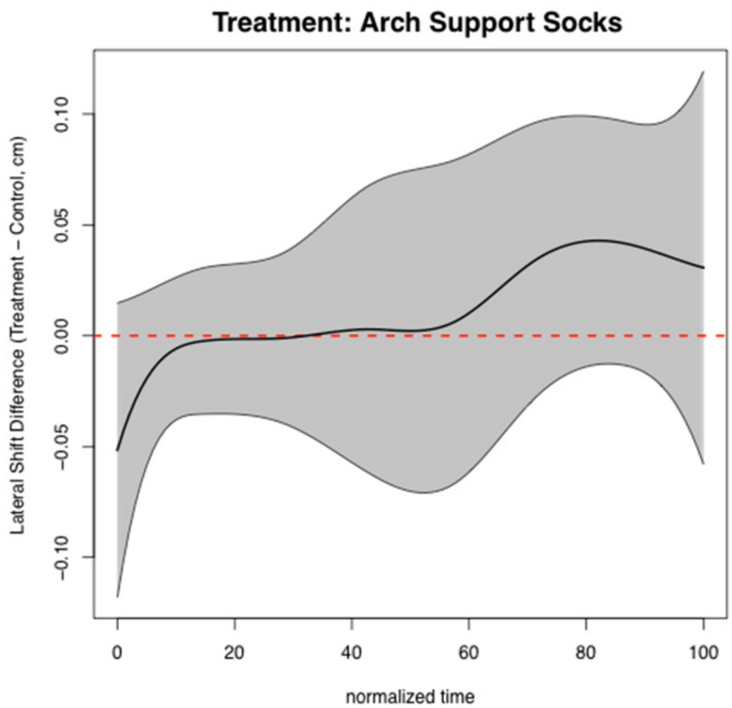

Figure 10: Functional analysis arch support socks, walking trials. Comparing the arch support socks to regular socks shows that the mean difference (treatment minus control) function is negative, but that the 95% confidence intervals for this function span zero. The black line in the center of the shaded area shows the mean difference in lateral shift (except on the control, where it is the mean lateral shift). The shaded area is the 95% confidence area. Accordingly, if the confidence area contains the red dotted line at 0, the mean difference function is not significantly different from 0 (or the 0 function), meaning that the lateral shift for the given treatment (arch support socks) is not significantly different from the control (regular socks) Thus, we cannot conclude that there is a significant difference between arch support socks and regular socks at the 5% level.

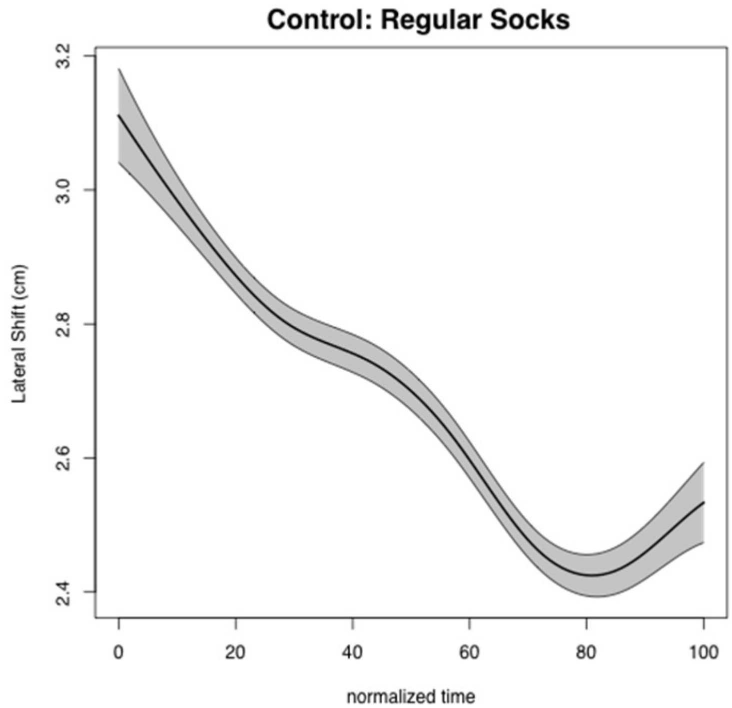

Figure 11: Functional Analysis of the control: Regular Socks. Running trials.

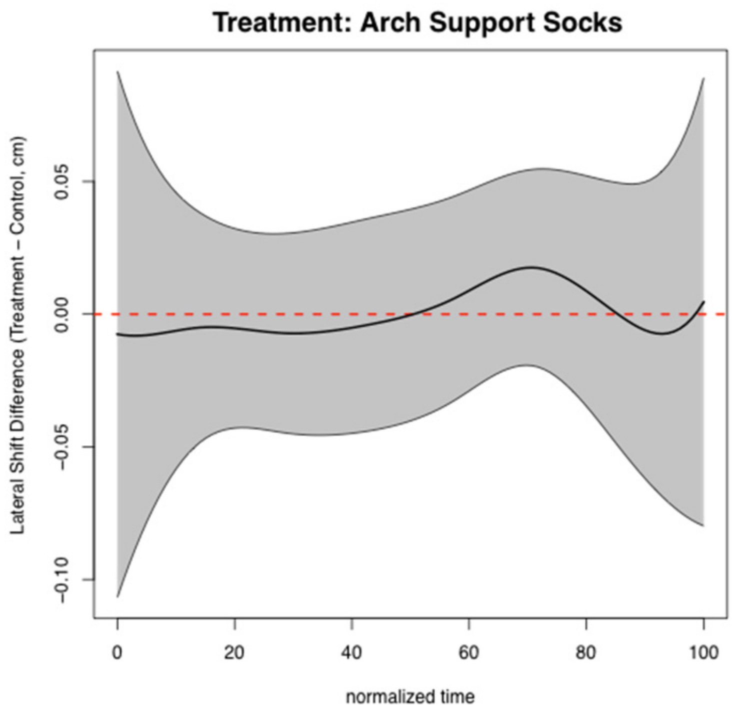

Figure 12: Functional analysis arch support socks, running trials. Comparing the arch support socks to regular socks shows that the mean difference (treatment minus control) function is negative, but that the 95% confidence intervals for this function span zero. The black line in the center of the shaded area shows the mean difference in lateral shift (except on the control, where it is the mean lateral shift). The shaded area is the 95% confidence area. Accordingly, if the confidence area contains the red dotted line at 0, the mean difference function is not significantly different from 0 (or the 0 function), meaning that the lateral shift for the given treatment (arch support socks) is not significantly different from the control (regular socks) Thus, we cannot conclude that there is a significant difference between arch support socks and regular socks at the 5% level.

Appendix A

History Questionnaire
Name:
Height (inches):
Weight (pounds):
Do you consider yourself in good health?
What is your physical activity level (days per week):
Do you wear custom orthotic inserts:
Have you had a lower limb surgery in the last year?
Have you had a lower limb physical therapy in the last 6 months?
Have you had a lower limb injury within the last month?

Appendix B

F-Scan Insole Calibration
To normalize plantar pressure data, the sensors have to be calibrated using the subjects' body weight. Below is a table describing step by step process to calibrating, using, and recording with the F-Scan technology.

Center of pressure (COP) measurements will be collected using the TekScan Technology by the following procedure. The F-Scan system will be used. For this experiment the pressure insole scan rate will be set at 200Hz yielding a two-dimensional movie image of a foot strike from heel to toe and medial to lateral boarders (i.e., a foot print), detected by its sensors.

Table 3: Taking an F-Scan (In-Shoe) Recording

Step 1 Prepare Patient

STEPS	Details
Seat Patient	
Remove Footwear	
Place ankle bands on ankles	Wrap ankle bands snugly around legs just above ankles
Trim Sensors	Locate patients shoe size on sensor Cut sensor on trim guidelines Trim off any partially cut connecting dots on both sides of sensors
Place sensors in footwear so that tab exits shoe on lateral side of leg	Insert sensor into shoe to check fit. The sensor should lie flat within the shoe so that there is no curling up on the sides.
Replace footwear	Instruct the patient to put on there shoes taking care that the sensors remains flat and in position.
Connect sensors to cuff units	Listen for "click" Look for 2 Green Lights on Cuffs
Stick cuff units to Ankle Bands	Stick cuff units to ankle bands leaving slack for ankle flexion
Stand patient	
Place belt around waist	Position belt so that velcro flap is on small of back
Secure cables to belt	Make loop in cables and slide velcro flap through loop leaving enough length between belt and cuff units for leg extension

Step 2: Launch Software Enter Patient Info

Start Software	Double click on F-Scan Icon on Desktop	
Enter Patient Data		
	If…. New patient	Then…. Click New Patient Enter patient info Click New Movie Sensor Selection: Options-> Select Sensor F-Scan - Check off Handles A and B Click OK
	Old patient	Click Open Patient Click on Patients name to highlight Click Open Patient Click New Movie Select sensor Check off handles A and B Click OK

Observe Realtime Window	You should see two feet Left & Right Have the Patient rock back and forth. Make sure you can see the landmarks of the feet. Look for any crinkles they will appear as bright red spots. If everything looks good Calibrate. If the images have too many crinkles consider redoing or retrimming. If everything looks good Calibrate.

Step 3: Calibrations

	If the Subject is….	Then….
Select Calibration Method	Walking	Select Walk Calibration Enter in Subjects weight Hit Enter Proceed to Take a Recording
	Standing / Balance or Running / Jumping	Select Step Calibration Enter in Subject Weight Hit Start and Follow Prompts Proceed to Take a Recording
	Other	Select Advanced Calibration

Step 4: Take a Recording

Create a Clear Walking Path	Mark starting and stopping point	
Check acquisition parameters	Option -> Acquisition Parameters	
	Enter / Check Acq. Parameters:	> Duration: Length of recording >Frequency: Sample rate; frames /sec. >Period: Sec/frame >Frames to record or Click default (8 sec. 50 hz)
	Triggering	Does not need to be selected for F-Scan Click OK
Instruct subject to begin walking/running	Click record	Hit stop when the Patient is done Walking or it will automatically stop once time (in duration) is reached.

Step 5: Save Recording

Save Movie Click FD Icon	OR File -> Save movie
Confirm Patient Info Enter Comments Enter Diagnosis / Procedure Click Yes	OR Enter New Patient if patient is New Type in or use drop down window to select procedure To save Patient to Database

Step 6: Analysis

What do we want to Analyze……?	If	Then
	Highest Area of Pressure	Click Show Panes Icon Create new graph - OK
	Timing	SECTION 3: ANALYZE TIMING
Refer to 4P Method Application Sheet	COF / COF Trajectory left v. right	SECTION 4: ANALYZE TRAJECTORY
	Symentry	SECTION 5: ANALYZE SYMMETRY
	Integral / Impulse	SECTION 6: ANALYZE INTEGRAL / IMPULSE