

The Use of the Power Step Shoe Insert to Manage Plantar Fasciitis Pain in Industrial Workers: A Seven-Year Pilot Report

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Abstract

We tested the effects of the Power Step shoe insert in a group of Facilities Management employees (n=23 staff, seventeen men, six woman, average 15 years of university service), 80% of whom have been clinically diagnosed with Plantar Fasciitis. Inserts were handed out to staff that qualified based on diagnosis beginning in 2008, and regular staff surveys were solicited every six months thereafter. New inserts were given to staff each year as they qualified. Over the course of seven years, eight staff personnel retired or left the program, and 10 were added to the program. Wear and tear of the insert, and pain levels based on McGill 1-10 rating scale were used each year. In the seven years of the program- the average length of use was 4.5 years, and pain levels were reduced from 4.83 (year one average) to 1.60, which includes new personnel who were added after 2010. Changes were also seen over time with individual workers who used the Power Steps for more than two years, seeing a decrease and levelling off of pain levels from the first year of use. The results of this program show that over time the chronic pain levels associated with work efforts in staff with Plantar Fasciitis are reduced by a statistically significant amount and clinically based on the addition of long- term Power Step inserts added to work boots and shoes in Facilities Management staff. This trend is continual even for newer users, and comparisons with non-power step usage shows significant variations in pain levels.

Keywords: Foot pain; Power step; Shoe insert; Orthotics; Foot rehabilitation

Introduction

Custom and prefabricated orthotics have been used to reduce pain levels and improve function in persons suffering from diseases such as Plantar Fasciitis, neuropathy, arthritis, and general foot pain [1-3]. Studies in runners and injured workers have shown the benefit of using orthotics to improve pain levels and performance in each group [4,5]. The use of orthotic devices is not new. Dye's use of strap taping for foot/fasciitis issues is over 60 years old, and stretching programs and orthotic boots have been in use for many years as well [6]. In the workplace, those who suffer from plantar fasciitis are given prescriptive drugs or injections for temporary pain relief. Although these types of modalities may have benefits, they may not take care of the problem at its source [7,8]. For those at risk or who are diagnosed with plantar fasciitis, many use orthotics. They assist workers in performing duties at a higher functional level with less pain [4,7,9]. Orthotics may provide chronic pain relief, and are prescribed, or purchased. Of concern to persons who purchase "over the counter" orthotics is the price. One solution is shoe inserts that can be purchased through drug stores or specialty shoe outlets. Although there is speculation within the mainstream press about the efficacy of such devices [10], they are recommended by Podiatrists and other medical/therapy professionals to improve function and reduce pain levels [11].

The Power Step is a shoe insert device that has been declared by the company to be a "starter orthotic". The product serves as an intermediary between a general shoe insert, and a prescribed orthotic device. This is seen in the price of Power Steps, which range from

discounted \$15.00 to retail \$40 [12], as opposed to prescribed inserts, which can cost \$150.00 or more [13]. A study by Pfeiffer et al. [14] found little difference in plantar fasciitis pain in runners who used expensive prescribed orthotics vs. over the counter brands (one being the Power Step). Since price is of concern to those who would use the insert on a regular basis, our goal was to take the price point out of this program, and distribute the Power Steps at no charge.

Over the past eight years, these Power Steps inserts were distributed to Facilities Management staff personnel at a California University who have been diagnosed with Plantar Fasciitis, bunions, Morton's Neuroma, or other medical foot ailments, and have used the Power Step to relieve their pain levels. These staff personnel work in areas such as custodial, grounds keeping, and skilled trades, such as carpentry, painting, and electrical. These professions use specific types of work boots (usually ridged soles and some steel toe) that have little flexibility in their movement. Any pain issues such as those described above may be exacerbated by work efforts on a daily basis.

Although there are some differences in professional opinion as to the benefits of shoe inserts for ankle stabilization and alignment, it is becoming increasingly clear that orthotics do have a place regarding reductions in foot pain. Recent online reports do point to the benefits of using orthotics with foot pain: "The best evidence of orthotic benefits is for reducing foot pain in people with rheumatoid arthritis and lower extremity arthritis. The right insert may also help slow damage caused by knee arthritis as well [11]. Of concern to the Facilities program is the level of pain threshold that would cause workers to reduce their daily workload, or take time off work to have their feet examined repeatedly by physicians regarding pain that may be ameliorated by the use of a chronic insert device.

The initial survey of our group was in 2008 after using the Power Steps for four months. We have followed the use of the insert program since that time with a yearly renewal purchase of the inserts and providing a pain rating scale survey for each participant. We are reporting our results from seven years of use.

Methods

Starting in 2008, Power Steps were issued to initially fourteen (14) Facilities staff (eleven men, three women, average age 50.8 years, 12.0 years of service, 92% diagnosed with Plantar Fasciitis within the past five years), all of whom have had at least one medical incident concerning their feet. These types of incidences include acute levels of sharp pain in the Plantar Fascia, chronic pain radiating to the toes from the mid-foot, and inability to walk without pain levels. These levels were high enough to make specific types of tasks (such as climbing a ladder or flexing the foot) impossible to perform. Almost all staff (92%) had used some form of shoe insert over the past few years. Six workers had used orthotics in the past – with an average cost of \$89.00 (range from \$15-\$300.00).

Over the course of the program, staff personnel have retired, and others were who came into the program and were selected because of their medical status (thus the fluctuation of the total staff numbers over the years as shown in Figure 1). Our highest number was 17 staff (2010/15), and our lowest participating number was ten (2012). Over the eight-year period, eight (8) staff personnel retired, or moved on to different jobs, and an additional ten (10) staff were added to the roster of those receiving Power Steps.

Staff was instructed to wear the inserts in their work shoes on a daily basis. They filled out an initial Modified McGill pain survey regarding current foot pain (1-10 pain levels, 10 is highest reported pain), types of shoes (and inserts) currently worn, and if they use (d) orthotics, what is status of their current condition. Power Step inserts were purchased directly from the company (www.powersteps.com, Cincinnati, OH), and distributed to staff at no cost. After their initial three months of use filled out the brief survey again based on their experience with using the product. Every eight to 12 months after the initial purchase, new inserts were distributed to staff and pain surveys were asked upon receipt. Every time staff receives a new pair of inserts, they fill out a brief survey of how they use the Power Steps (Appendix I). Pain rating scales were analysed on successive years using a Student's T-test (setting alpha at 0.05 significance) [15].

The interaction within each employee was also viewed in relationship to each person's change in pain levels over the duration of the program. Starting in 2009, those employees who started the program and had at least six years of data were used in the ANOVA analysis (Table 1).

Staff	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1	4	5	8	2	1	1
2	8	7	6	6	3	3
3	5	8	3	3	0.5	1
4	6	4	3	3	2	1
5	6	3	3	3	1	2
6	5.5	4	5	1.5	1.5	2

7	5	5	2	3	2	2.5
N	7	7	7	7	7	7
X	5.6	5.1	4.2	3.1	1.6	1.7
SD	1.3	1.7	2.1	1.4	0.8	0.8
Source	DF	SS	MS	F Stat	P value	
	5	102.9	20.59	9.75	<0.001	

Table 1: Analysis of Variance information on staff who participate in Power Step program for at least six years and annual pain data for each (F=9.75, p<0.001).

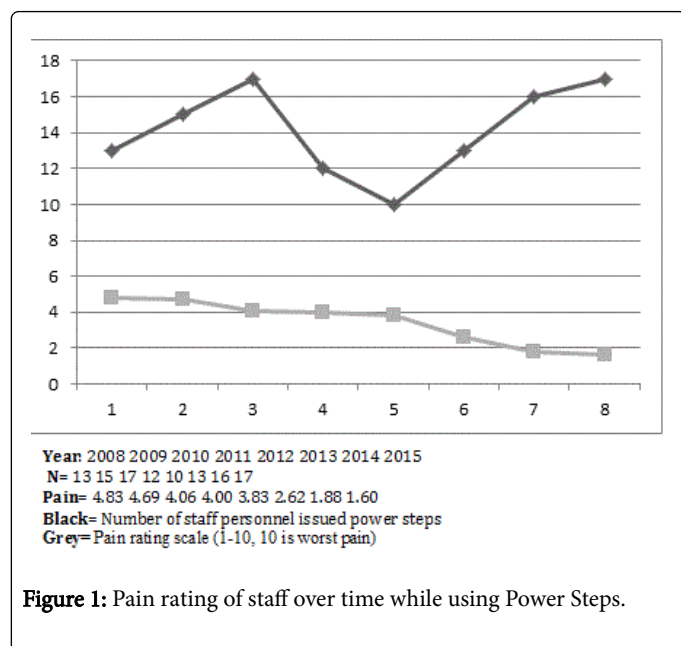
Results

The Power Step products were worn for over seven hours per day-average time was 7.6 hours (one staff worker used the inserts for four hours each work day). Initial pain levels in staff measured (using a McGill pain rating scale), of 4.83+1.7 on a 10-point scale. This pain level is high enough to compromise work efforts, and challenge management to modify work duties to compensate for pain thresholds. These employees are also at higher risk for absenteeism and illness due to foot complaints. Comparisons were made between years taking each employee's first year as a baseline to subsequent reporting years.

Pain levels reduced in nine out of 11 staff members (one increased pain over time; one reported no change in pain levels) during the initial year. The majority of staff stated that wearing the product made a measurable and noticeable difference in their work day - from the amount of time they could stand on their feet, how far they could walk, and the ability perform specific job tasks (stooping, flexing, lifting, etc.). Over each successive year, the level of pain was reduced continually. By the last year of data collection, (2015) overall pain levels were reduced in all employees to an average of 1.60 (p=0.002) a very manageable level of pain in each person. In fact-this level is almost unnoticed by each person, and has had no effect on their work capabilities. Statistics were compared using a paired t-test [8].

In 2015 staffs were issued Pinnacle Maxx inserts from Power Steps. During this survey, staff (n=17) were asked about pain levels without using Power Steps (off work or recreation) vs. using Power Steps (work shoes and during work hours). The average pain levels in staff during non-work hours was 5.09 (+1.05), compared to working hours using Power Steps in work shoes, which was recorded at 1.56 (+0.45). This distinction was significant (p<0.0001). During the 2015 staff survey, none of the participating employees were under the care of their physician/podiatrist for any type of foot problem.

Using individual staff statistics for those who participated in at least six years of the program, there was a steady decline in every employee who continued to use the insert each year of use (Table 1). Over the tenure of the program, the overall trend was a steady reduction in pain levels to a very manageable level of just over one and a half (on a 10 point scale).



Discussion

The use of the Power Step shoe insert was shown in a small group of Facilities workers to reduce chronic pain levels and allow them to continue to perform their daily job tasks with no undue discomfort. Staff members liked the "feel" of the insert, and would use the product over time, and recommend it to fellow workers and others. The continual reduction in pain levels is also a very good sign of the efficacy of the product. Even in the last two years as the number of new users has gone up, the total reduction in pain for all employees has decreased. A level five (or 4.83) is a very uncomfortable level of pain to work in. Many workers needed to change shoes or take breaks during their work day to alleviate their foot pain by sitting, rubbing, or both. As pain levels reduced to "less than two" (or 1.60), many workers commented that when using the inserts, they didn't notice any pain. Levels of pain did increase during times when they did not use the inserts, but this was during off-work hours.

The analysis of variance showed a steady decline in almost all staff personnel throughout the years of the program. The small increases in pain of these individuals may have less to do with the use of the insert as to factors contributing to pain levels on that day (such as day of the week of the survey, the amount of labor performed on that day, etc.). This variation in pain levels is a normal part of their work experience, and is taken into account in the results. Even with variations in work effort, the Power Steps had an overall effect of reducing pain in every staff member throughout the course of this program, and independent of the nature and amount of work performed at any given survey.

In terms of cost- Power Steps range in price from \$31.00 to \$40.00, less than the average of \$89.00 spent by staff for professional orthotics, and with outcomes that match or exceed improvement in the condition of the foot from a comfort and pain standpoint. Our experience within a university/government setting is that the cost of Power Steps is substantially reduced for employees based on non-profit status and the amount of inserts ordered at any given time. Current reports [14,16-18] suggest that these types of prefabricated over the counter inserts work as well or better than custom made orthotics. Without

getting into a debate regarding the merits of having a custom devise made for patients, it seems prudent in this case to have workers who are in need of some type of orthotic devise start with a prefabricated insert first, and use it for work purposes. In most cases, it will reduce pain, improve their work experience, and save them money. It may also save them numerous trips to specialty shops trying to find a "perfect fit" when an over the counter version works as well, saving money and time.

In conclusion, we found that the use of the Power Step insert worn over a period of three months (to seven years) made a measureable difference in acute and chronic pain reduction in all of Facilities staff personnel who wore the product. They would continue to wear the insert and recommend it to fellow staff workers in terms of reducing pain levels in feet during work shifts.

(Medical Health and Fitness reports no financial ties to Power Steps during the course of this project. All inserts were purchased as part of a regular program in the department, and assigned to staff).

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