

## Comparison of the Five Leading Industrial Insoles based on Personal Preferences and Balance Performances

### Abstract

The study examined the relationship between personal preferences and the relationship insoles had on dynamic standing balance reactions. The subjects responded to ten different subjective questions after each of the five insoles were tested on a dynamic computerized force plate. The subjects' balance reactions were all challenged in eight different directions at the maximum of 100% of an individual's limits of standing stability. Designated insole A acted as the control variable representing the subject standing with socks on with no footwear. The orders of insoles were randomized for each subject trials with one trial being the control. The remaining insoles were assigned Insole B, C, D, E (MEGACOMFORT PAM Insoles), and F respectively. The study identified a positive relationship between the subject's preference and the improved performance in dynamic standing positions. The material characteristics of the preferred insole provided unique identifying properties for improved decision-making among insole choices for safety managers.

### Methods and Results

The subjects responded to a survey asking them to the following: characterize the overall firmness of the insole, rate the level of firmness in levels from 1-10 with 10 being the firmest, level of shock absorption, perceived affect on their balance reactions, the level of arch support with 10 being too much arch support, rate the breathability, fit in their footwear, overall comfort, and whether they would recommend a particular insole.

INSOLE	Characterize Firmness	Level of Firmness	Shock Absorption	Affect on Balance	Recommend	Arch Support	Rate Arch	Breathability	Fit	Comfort
B	60% Too Firm	6	5	6	60% Not	60% Too Little	5	6	6	5
C	80% Just Right	6	7	6	70% Yes	50% Just Right	5	7	7	7
D	70% Just Right	6	7	6	100% Yes	70% Too Little	5	5	7	7
E	<b>90% Just Right</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>100% Yes</b>	<b>80% Just Right</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>8</b>
F	50% Just Right	6	6	6	60% Yes	50% Too Little	6	7	6	6

Table 1. Represents the subjects' average responses from the ten questions noting Insole E (MEGACOMFORT PAM) producing the best average results for all ten questions.

There is a concern that any safety initiatives consider improving not only the comfort of employees but also the potential impact on their performance in standing work tasks. The control variable (no insole or footwear) presented a view of normal balance performance and thus a comparison for the five insoles as having negative or positive influence a person's balance reactions. In that comparison and to varying degrees, all insoles exhibited a positive impact on all balance reactions when compare with no insoles at all.

Three important balance components tested during the computerized force plate relate most acutely to standing work tasks and productivity. The first balance component engages the subject's initial stopping point where they can safely attempt to reach their target (as a percentage towards the end-point or target). This point highlights the subject's ability to function and make efficient balance adjustments on firm (concrete floor) or an unstable surface (too much cushioning). The second is the ability to reach the end-point or ultimately achieving the target, which is the continuation of the first balance component. The final and most imperative balance feature is related to directional control, in other words, does any introduction of cushioning permit the subject to reach their target safely and proficiently. Tables 2, 3, and 4 exhibit the results of the computerized balance force plate testing of the subjects. In all three balance components, in summary Insole E performed the most effective at 89.5%, 98.4%, and 83.1% respectively.

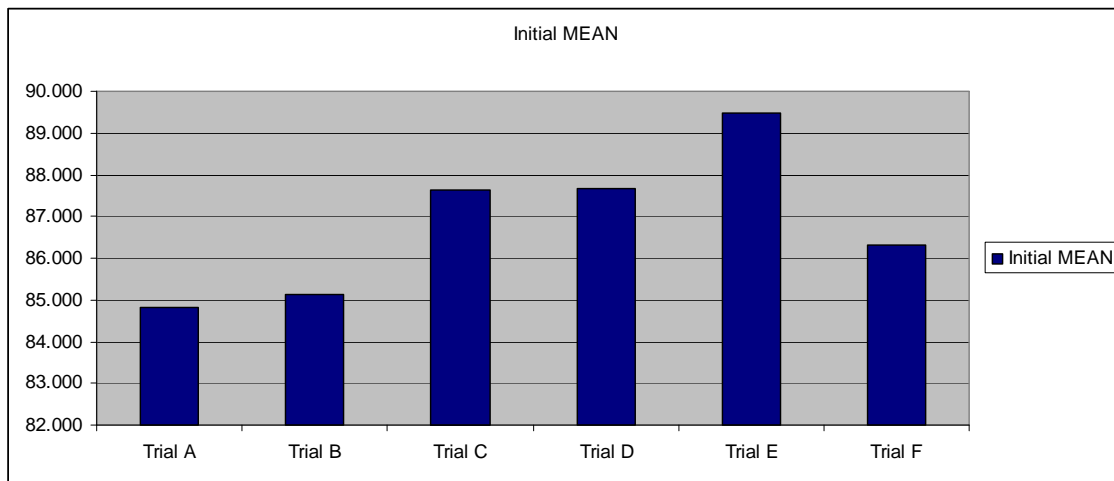


Table 2. The percent of reaching the subjects intended target on the first try.

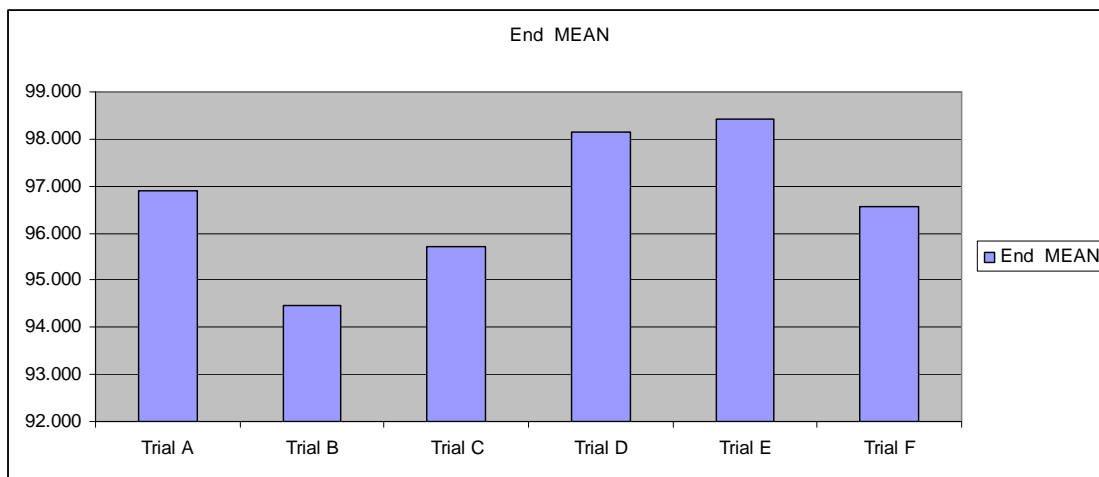


Table 3. The percent the subjects were able to correct and continue to their target.

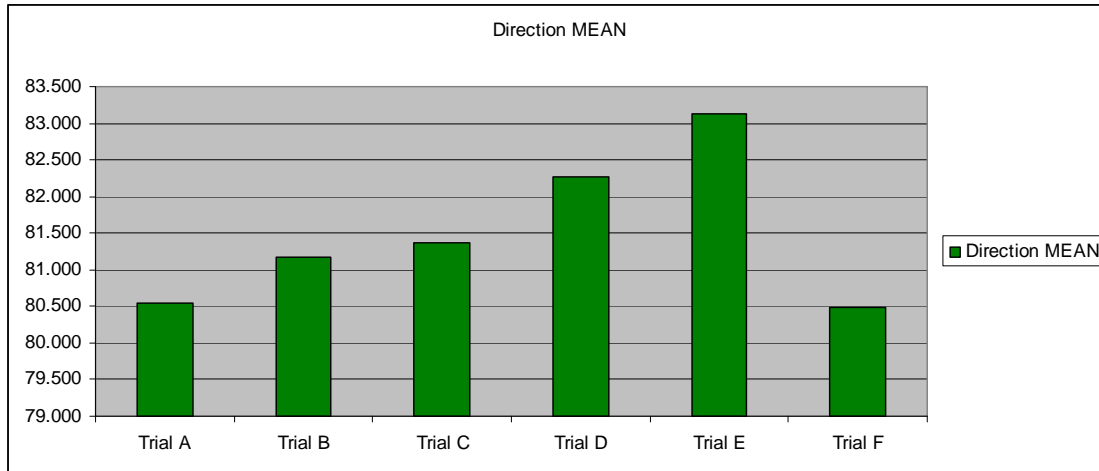


Table 4. The directional control of the subjects while standing on different insoles made of different materials. Trial A and F represented hard surfaces.

### Discussion

Among the different insoles, the overall results support the intervention of cushioning between the worker and the ground or ground reaction forces. The study exposes the critical role of material density and characteristics of insoles that will have an influence on the workers' ability to interact efficiently within their work environments. The study provided an objective and comprehensive evidence of performance characteristics highlighting three important balance components. This study offers a better understanding of insole material characteristics when placed between the worker and concrete surfaces. It also signifies that introducing insoles at the workplace will not only relieve some of the subjective discomfort associated with standing work tasks but also assist in work performance. The results of this study correlate with an earlier study and continue to support the overall benefits favoring the use insoles similar to the material profile of Insole E with a subtle contour matching the foot profile and mid-level softness in the range of 20 to 30 durometers (Shore A scale).

### Conclusion

The study shows that of the leading five industrial insoles, MEGACOMFORT PAM Insoles were subjectively preferred and would be the best choice for standing job tasks requiring specific key strokes, accuracy of placing parts, task accuracy productivity, and fine motor activities involving the hands.

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