THE EFFECTS OF TOTAL CONTACT INSOLES WITH METATARSAL PADS IN HIGH HEELS DURING THE GAIT CYCLE
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INTRODUCTION
High heels have been a staple of a woman’s wardrobe for hundreds of years. Although the styles and heel heights have varied, the one thing that unchanged is the wearer has experienced more condensed pressure in the forefoot. Increased forefoot pressure can lead to pain, discomfort, and tension on the plantar aponeurosis (Yung-Hui & Wei-Hsien, 2005). Besides pain in the forefoot, increases in heel height have also caused various compensations such as lower back pain, shortened stride, muscle fatigue, and Hallux Valgus.

The aim of this study was to investigate whether a total contact insert (TCI) with a metatarsal pad (MT pad) would allow a woman wearing high heels to walk with a more efficient gait by spreading the impact force from the 1st and 2nd metatarsal to the entire forefoot.

METHOD
Subjects: Eight healthy women, between the ages of 23 and 33 and accustomed to walking in high heels.

Apparatus: Zeno Walkway by ProtoKinetics, total contact inserts with metatarsal pads, high heels

Procedures: The participants were instructed to walk in their heels for a total of twelve laps, six with the total contact insert (TCI) with metatarsal pad and six without the TCI

Data Analysis: Single Stance Center of Pressure and Stride Length were analyzed with the PKMAS software by ProtoKinetics. Two-way t-tests were employed for the statistical analysis, with the level of significance set at 5% (p < .05).

RESULTS
For single stance center of pressure, there was a significant increase (p=0.048) while there was not for stride length (p=0.283). All the participants claimed that the metatarsal pad increased their comfort level while wearing their high heels.

<table>
<thead>
<tr>
<th></th>
<th>WITH PAD</th>
<th>W/OUT PAD</th>
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</thead>
<tbody>
<tr>
<td>SS COP Mean</td>
<td>5.221</td>
<td>5.077</td>
</tr>
<tr>
<td>SS COP Std. Dev</td>
<td>0.691</td>
<td>0.662</td>
</tr>
<tr>
<td>Stride Length Mean</td>
<td>132.920</td>
<td>133.599</td>
</tr>
<tr>
<td>Stride Length Std. Dev</td>
<td>3.400</td>
<td>3.828</td>
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</tbody>
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Table 1.

DISCUSSION
The purpose of this study was to investigate if, while wearing high heels, perceived comfort could be increased by adding padding under the metatarsal heads. Stride length was used as a proxy for efficiency and SS COP for impact force.

For SS COP between conditions, there was a significant increase while there was not for stride length. All the participants claimed that the metatarsal pad increased their comfort level while wearing their high heels. The finding of increased comfort in using TCIs in high heels was consistent with those of Hong et al (2005).

Limitations of this study will be addressed in future studies. These limitations included small sample size, differing shoe construction (height, type), uneven fabrication and placement of MTP in TCI, and not having the appropriate data measurement system to collect in-shoe pressures.

CONCLUSION
The results of this study were inconclusive and future work on the subject will need to have the limitations of this study addressed.

CLINICAL APPLICATION
The clinical relevance of this study is that further studies need to address how high heeled shoes impact gait and how gait can be improved while wearing high heels.

REFERENCES