

Effects of Topical Analgesic Cryotherapy on Postural Sway

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Abstract. Topical analgesic (TA) agents are readily available over-the-counter, and are marketed to physical therapists as well as the general public as quick solutions for acute and chronic joint and muscle pain. The purpose of this study was to determine if a change in postural sway occurred following the application of a TA to the lower leg. A better understanding of a TA's effects on postural sway will provide knowledge on the use of this type of analgesic in regard to overall safety and balance. Subjects consisted of 34 individuals ranging from 18-30 years old recruited from the Wichita State University student population. Postural sway was measured in each subject using the Biodex Balance System SD. Subjects underwent a familiarization session, performed a pretest, and then a posttest following the application of a TA. No significant difference was found between pretest and posttest postural sway. Due to lack of support in the literature, further investigation is necessary to confirm these results.

1. Introduction

In previous studies, the effects of cryotherapy on balance and proprioception on different parts of the body were observed. Each study documented negative effects from cryotherapy on proprioception, joint position sense, and functional ability in the shoulder, knee, and ankle. (1-4). Cryotherapy modalities in these studies included ice pack, cold spray, and ice bath immersion; however, no studies exist using a topical analgesic cryotherapy on muscles affecting ankle balance strategy. A topical analgesic cryotherapy agent was used due to its availability and widespread advertisement for the use of acute and chronic pain relief. No research exists on the effects of a topical analgesic on postural sway in regard to ankle balance strategy. The purpose of this study was to identify a possible change in postural sway, including anterior/posterior and medial/lateral movement related to a TA application to the lower leg. We hypothesized that postural sway would increase as measured by overall stability index (OSI), anterior-posterior stability index (APSI), and medial-lateral stability index (MLSI).

2. Experiment, Results, Discussion, and Significance

All testing was completed using the Biodex Balance System SD (BBS SD). The BBS SD requires the participant to stand bare-footed on a force plate for the duration of the test. The BBS SD measures a number of different functions; however, for the purposes of this study measures of postural sway were used including OSI, APSI, and MLSI. Postural sway is a combination of amplitude and velocity of movement deviation away from the center of pressure of the balancing foot. Each participant was tested once. This session included familiarization, a pretest, and a posttest. The pretest and posttest involved the participant performing a single leg balance test with eyes open standing on the force platform. Each pretest and posttest consisted of three ten-second trials with a ten-second rest between trials. The BBS SD provided a measure for OSI, APSI, and MLSI for each trial. The pretest measurements were the baseline. Then 5 grams of TA gel was measured using a Salter 16-ounce mechanical diet scale, and the TA gel was applied to the lower dominant leg of each participant. The posttest was performed five minutes after the TA application. During all testing, a researcher was within arm's length to provide stand-by assistance and to ensure the subjects' safety. No significant difference occurred between pretest and posttest postural sway indices following the TA application (Table 1). A slight decrease occurred in postural sway in all three indices after TA application. An increase in postural sway and an increase in the variance in the percentage of time spent outside of Zone A following the application of the TA cryotherapy agent to the lower leg was expected (Table 2, Figure 1). Application of a TA over the lower leg muscles did not significantly affect postural sway. Based on the results, it appears that TA agents are safe for their intended use in the clinic without inhibiting ankle balance strategy.

3. Conclusions

Postural sway and overall balance were not affected by the application of a topical analgesic cryotherapy agent to the lower leg; however, based on the limitations noted in this study, further research is necessary to confirm these findings.

4. Acknowledgements

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Table 1. Pretest and posttest postural sway indices, including overall stability index (OSI), anterior/posterior stability index (APSI), and medial/lateral stability index (MLSI); mean \pm SD (deviation away from the center of pressure) n=34

| | OSI | APSI | MLSI |
|----------|-----------------|-----------------|-----------------|
| Pretest | 1.01 \pm 0.61 | 0.70 \pm 0.51 | 0.56 \pm 0.37 |
| Posttest | 0.94 \pm 0.63 | 0.68 \pm 0.56 | 0.49 \pm 0.34 |

Table 2. Mean \pm SD; Percentage of time spent in concentric balance zones of the Biodex Balance System SD during testing procedure; (see figure 1 for representation of balance zones) (n=34)

| | Pretest | Posttest |
|--------|------------------|------------------|
| Zone A | 99.32 \pm 2.40 | 99.97 \pm 0.17 |
| Zone B | 0.68 \pm 2.40 | 0.03 \pm 0.17 |
| Zone C | 0 | 0 |
| Zone D | 0 | 0 |

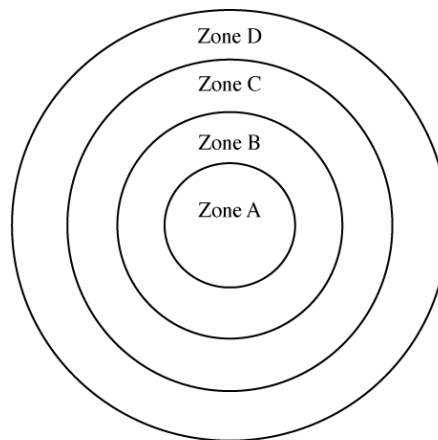


Figure 1. Concentric Balance Zones of Biodex Balance System

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