A Comparison of Three Types of Electrical Stimulation: An Investigation into the Length of Time Taken to Achieve Perceived Patient Accommodation

Alvernia University Athletic Training Education Program

Sean Castineira, Megan Corrigan, James Fynes, Drew Gilbert, Karen Hess, Jason Karpinski, Daniel Kropf, Kristin Mantle, Donald Rutherford, Kellee Schaffer, Melissa Schmeck, Allison Toczykowski, and Renelle Weidner

Faculty Advisors: Dr. Kim Stoudt, Professor Dolores Bertolli, and Professor William Thorne

ABSTRACT

Based on the Gate Control Theory, electrical stimulation is a therapeutic treatment used by allied health professionals to alleviate the perception of pain and thus its effect. Current literature indicates evidence on efficacy and the intensity of electrical stimulation is used to delay the onset of pain sensation. This study investigated the effects of electrical stimulation and compared the time to achieve a perceived accommodation. The results indicated that there was a significant difference in time to achieve a perceived accommodation between the three types of electrical stimulation (ICF, TENS, and HES). In addition, the results indicate that a greater number of participants achieved a perceived accommodation time of less than 15 seconds. The results also indicate that the three types of electrical stimulation may be equally effective in delaying the onset of pain sensation. However, further research is needed to determine the optimal parameters for each type of electrical stimulation.

BACKGROUND

- Sensory Electrical Stimulation: a common rehabilitation modality used for the relief of pain among Allied Health professionals
- Accommodation: the perceived lowering of pain sensation at the site of stimulation
- Three types of Sensory Electrical Stimulation used in this study:
  - Intermittent Current (ICF)
  - Transcutaneous Electrical Nerve Stimulation (TENS)
  - High-Voltage Electrical Stimulation (HES)

METHODS

- Each participant received a single TENS, ICF, or HES stimulus after a period of rest
- Participants were randomly assigned to one of the three types of stimulation
- Data collected included:
  - Accommodation time
  - Pain rating at rest and during stimulation
- Statistical analysis performed using Statistician 22

RESULTS

- A significant difference was found for Accommodation time among the three types of electrical stimulation:
  - TENS: 15 seconds
  - ICF: 15 seconds
  - HES: 15 seconds

CONCLUSIONS

- This study investigated the primary null hypothesis that ICF has a significantly longer mean perceived accommodation time than TENS and HES.
- TENS showed a significantly longer mean time of perceived accommodation than HES and ICF.
- TENS showed a significantly longer mean time of perceived accommodation than the three types of electrical stimulation (ICF, TENS, and HES).
- Participants had a longer accommodation time overall compared to baseline.
- TENS was not shown to have a significant difference between gender.
- There was a significant interaction effect between the three types of accommodation and gender.

FUTURE CONSIDERATIONS

- It is recommended that further studies be conducted to examine the initial intensity level of electrical stimulation and its effect on the time to achieve perceived patient accommodation.
- It is also recommended that a greater number of participants be used in future investigations.
- It may be beneficial to record the intensity levels throughout the treatment.
- Since this study suggests an interactive effect between gender and stimulation technique, further study is advised.

STATISTICAL METHODS

- Question 1: examined average (mean) times among three stimulation techniques.
- A repeated measures ANOVA, using mean accommodation times for each subject, was used to compare the three types of electrical stimulation.
- Question 2 and 3 used a repeated measures ANOVA utilizing a mixed design with between and within-subjects.
- Question 2 examined average accommodation times between male and female subjects.
- Question 3 examined average accommodation times for the interaction between gender and stimulation technique.