Re: Sluka KA, Bjordal JM, Marchand S, Rakel BA. What makes transcutaneous electrical nerve stimulation work? Making sense of the mixed results in the clinical literature.

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Dear Editor,

We read the article recently published by Sluka and colleagues[1] in *Physical Therapy* with great interest. The elements raised by the authors shed important light on the mixed results obtained in the literature concerning the analgesic effect of transcutaneous electrical nerve stimulation (TENS). In their article, Sluka and colleagues identified many factors that can affect TENS efficacy. We would like to take this opportunity to highlight three other important elements than can affect the analgesic effect of TENS, and to remind physical therapists of the importance of considering these elements in their day-to-day practice.

1) Caffeine consumption

In 1995, Marchand and colleagues demonstrated that caffeine could block the analgesic effect of high-frequency TENS.[2] Monitoring caffeine intake before treatment is essential if we want to maximize the analgesic effect of TENS. This obviously includes coffee, but also other sources of caffeine (e.g., tea, chocolate, energy drinks). Surprisingly, very few TENS studies published since 1995 have monitored caffeine consumption, a situation which is particularly problematic when we consider that individuals with certain chronic pain conditions tend to consume high quantities of caffeine.[3] The half-life of caffeine is 4-6 hours.[4] To assure optimal efficacy, TENS treatment should be delayed for 6 hours after caffeine intake.

2) Electrodes placement

To maximize TENS analgesia, the experimenter needs to ensure good positioning of the electrodes. Current norms in research often encourage researchers to use a single and standardized electrode position for all patients. However, in order to be effective, electrode placement should be adapted individually, based on the location of the patient's pain.[5, 6]

Electrode placement is especially important when using high-frequency TENS, a type of TENS which produces analgesia via local/segmental mechanisms.[7] In such situations, the experimenter needs to be sure that the TENS-induced paresthesia appropriately covers the entire painful region.

3) Pain intensity

In 1997, Benedetti and colleagues[8] showed that patients with severe pain responded less positively to TENS stimulations compared to patients with mild or moderate pain. These observations indicate that the intensity of clinical pain greatly affects the efficacy of TENS. Choice of the proper treatment must be done while taking in consideration the patient's individual characteristics. TENS might not be the best treatment option for patients with high levels of pain.

Clinical implications

Ensuring proper positioning of the electrodes and screening for caffeine consumption requires time. With their busy daily schedules, physical therapists may tend to neglect these crucial steps. They must nevertheless remember that TENS, just like many other treatment modalities used in rehabilitation, requires time in order to be properly administered. By discarding certain essentials steps, physical therapists run the risk of affecting negatively and lastingly the efficacy of TENS treatments.[9, 10]

In their article, Sluka and colleagues observed that the timing of assessment is another important issue which could account for the mixed results observed in the literature. We agree with the arguments raised by the authors: the effect of TENS, just like the effect of any other given intervention, should be measured during peak effect. The authors noted that the analgesic

effect of TENS is maximal during TENS stimulation, an observation which was also reported by Wall & Sweet in 1967 in one of the first studies published on TENS.[6] In addition to being important to research, this observation bears important consideration in clinical settings. Specifically, in patients with chronic pain, TENS should rarely (if ever) be used solely in clinic. Instead, chronic pain patients should be taught how to use TENS at home; a strategy that will allow these patients to take full advantage of the analgesic effect of TENS therapy.

Conclusion

Several factors must be considered when using TENS. These factors include the intensity of the TENS stimulation, its interaction with pharmacological and non-pharmacological agents, the target population, the outcomes measured, the study design and the patient's characteristics. We wish to thank Sluka and colleagues for their commendable article and hope that the elements raised by these authors, as well as the subject discussed in the present paper, will contribute to a better use of TENS in research and in clinic.

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