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Comparing the Effectiveness of Acupuncture and Clinical Hypnosis on Pain, Anxiety, and Cortisol Levels in a Child with Burn Injury: A Single-Case Experimental Study

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ARTICLE INFO	ABSTRACT
<p>Article History: Received 4 August 2022 Received in revised form 19 October 2022 Accepted 10 November 2022 Available online 1 December 2022</p>	<p>Background: Burn injuries and the wound care process are highly painful and anxiety-inducing for children. Alongside pharmacological analgesics, non-pharmacological interventions play a critical role. Hypnosis has been employed to reduce pain and anxiety associated with burns in adults. Similarly, acupuncture has been used to alleviate pain and improve psychological outcomes in individuals experiencing acute and chronic pain. However, the comparative effectiveness of these two treatments in pediatric populations has not yet been explored. Methods: This single-case experimental study was conducted between October 2018 and January 2019. An eight-year-old child with an acute burn on the left hand was selected via purposive sampling. An ABAB reversal design with multiple baselines was implemented across four time points, during which the child received acupuncture, natural hypnosis, and clinical hypnosis. Assessments were conducted over a 24-week period. Data were analyzed using generalized estimation equations and repeated measures correlation. Results: Initial findings indicated that clinical hypnosis significantly reduced pain and anxiety ($p < 0.05$), but had no significant effect on salivary cortisol levels ($p = 0.93$). Acupuncture demonstrated significant effects on reducing pain, anxiety, and salivary cortisol ($p < 0.05$ for all). Secondary analyses revealed significant positive correlations among pain, anxiety, and cortisol levels ($p < 0.01$). The only significant difference between the two interventions was observed in the effect of acupuncture on salivary cortisol ($p < 0.05$). Conclusion: The findings of this study, consistent with previous research, suggest that both acupuncture and clinical hypnosis are effective for specific physiological and psychological indicators in pediatric burn patients. These results may inform the development of tailored therapeutic programs, though further research is needed to clarify the differential effectiveness between the two treatments.</p>
<p>Keywords: Hypnosis, Acupuncture, Burns, Children, Cortisol, Anxiety, Pain</p>	

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1. INTRODUCTION

Burn injuries resulting from improper use of household appliances represent a growing concern among pediatric populations [1]. Among the various causes of burns, scalds from hot liquids are among the most common sources of injury in children [2].

Second-degree burns, also known as partial-thickness burns, extend deeper than first-degree burns, affecting both the outer layer of the skin (epidermis) and part of the underlying layer (dermis). These burns typically cause blisters, severe pain, redness, and swelling. When blisters rupture, the burn area appears pink to red with a moist surface. Pain is a prevalent and significant issue in burn patients [3]. Furthermore, the burn injury itself and the associated wound care procedures can be highly painful and anxiety-inducing for children [4]. Effective pain management in pediatric burn patients is therefore critically important.

In recent years, the use of complementary and alternative medicine alongside pharmacological interventions has gained increasing attention among clinicians [5] (Pirnia et al., 2018). Acupuncture is a therapeutic approach that has been employed worldwide for over two thousand years [6]. Auricular acupuncture, a specific form of acupuncture, was first described approximately 2,500 years BCE and is currently implemented through the National Acupuncture Detoxification Association (NADA) protocol in 250 hospitals across the United Kingdom and the United States. NADA provides a practical manualized protocol focused on stimulating three to five specific points on the ear. It is evidence-based, client-centered, cost-effective, minimally invasive, and widely used in routine medical and psychosocial care [7,8]. Studies have demonstrated that acupuncture can effectively reduce chronic pain [9] (Pirnia & Pirnia, 2018). Moreover, Pirnia et al. (2018a, 2018b) reported its efficacy in alleviating musculoskeletal pain [10,11]. In contrast, a study by Pirnia et al. (2017) found no significant effect of acupuncture on musculoskeletal pain reduction [12].

On the other hand, clinical evidence suggests that psychological interventions, including hypnosis, should be employed as adjuncts to medication for burn patients (Provencal et al., 2018) [13]. A meta-analysis by Provencal et al. (2018) indicated that hypnosis significantly reduces pain and anxiety in burn patients. Similarly, a trial by Jafarzadeh et al. (2018) reported that two sessions of hypnosis significantly decreased both pain and anxiety levels [3]. Conversely, findings from Chester et al. (2018) indicated that hypnosis did not significantly reduce pain in pediatric burn patients [14].

Stressful stimuli trigger the release of corticotropin-releasing hormone from the hypothalamus, which in turn stimulates cortisol secretion. The effectiveness of acupuncture in reducing cortisol levels has been supported by prior research. Several studies have shown that acupuncture regulates the hypothalamic-pituitary-adrenal (HPA) axis, improving adrenocorticotropic hormone function and modulating cortisol secretion (Wei et al., 2017) [15]. Additionally, acupuncture has been reported to reduce cortisol levels in patients experiencing cancer-related pain (Pirnia et al., 2017) [16]. Cortisol levels are also significantly associated with mood-related indices, such as anxiety and depression (Pirnia, Janbozorgi & Pirnia, 2017) [17], although some studies (Pirnia, Givi et al., 2016) have reported non-significant associations [18].

Given the inconsistent findings regarding the effectiveness of acupuncture and hypnosis on pain, anxiety, and cortisol levels, along with the lack of prior research directly comparing these two interventions in children, and considering the importance of biological markers such as cortisol in understanding the pathophysiology of psychiatric conditions, this study aimed to compare the effectiveness of acupuncture and clinical hypnosis on pain, anxiety, and salivary cortisol levels in a child with burn injury.

2. CASE PRESENTATION

The present study employed a single-case experimental design. Data were collected between October 2015 and June 2016. An eight-year-old child with an acute burn on the left hand was selected through purposive sampling and participated in a reversed ABAB design with multiple baselines. Over a 24-week period, four interventions—Sham, auricular acupuncture, neutral hypnosis, and clinical hypnosis—were each administered for six weeks, and repeated measurements were taken throughout the study.

Auricular acupuncture was performed once a week for six weeks (six sessions), with each session lasting 30–45 minutes and conducted before lunch. The participant was seated comfortably in a quiet room. During each session, five auricular points—Sympathetic, Shen Men, Kidney, Liver, and Lung—were targeted. In the Sham condition, stimulation was applied 2 mm away from the original points (Pirnia, Pirnia, Teymoori et al., 2017). Acupuncture was performed bilaterally using single-use stainless steel needles (0.25 × 13 mm) inserted to a depth of 2–3 mm and manually stimulated by a trained physician and a licensed acupuncturist with five years of clinical experience (second author).

Prior to the intervention, the Stanford Clinical Hypnotizability Scale was administered to assess the child’s susceptibility to hypnosis. This scale includes five items: hand movement toward each other, a dream scenario, age regression, post-hypnotic suggestions, and post-hypnotic amnesia. During the hypnotic intervention, four techniques—eye fixation, progressive muscle relaxation (PMR), Kyson technique, and hand levitation—were used for induction. Imagery, dissociation, and PMR were further employed to deepen the trance. Neutral hypnosis served as a placebo, consisting of general, non-therapeutic suggestions (Jafarzadeh et al., 2018) [3].

Salivary cortisol was sampled twice weekly at random intervals. Saliva was collected using Salivette® tubes, with the participant depositing saliva through a small straw into labeled tubes noting time and date. The participant was instructed to avoid food, teeth brushing, or any drink other than water in the hours prior to testing. Rapid fluctuations in morning cortisol levels were Winsorized if concentrations exceeded four standard deviations from the mean. Samples were stored at –20°C or lower until analysis, centrifuged at 3,000 rpm for 15 minutes at room temperature, and analyzed using a highly sensitive enzyme-linked immunosorbent assay (ELISA) kit. Missing cortisol samples were replaced with mean values.

The study employed a structured clinical interview (SCID-5), the Stanford Clinical Hypnotizability Scale (SHCS), Spence Children’s Anxiety Scale (SCAS), Visual Analog Scale for pain (VAS), and competitive ELISA kits. Data were analyzed using generalized estimating equations and repeated measures correlation in SPSS 22, with significance set at $p < 0.05$. All procedures were conducted after obtaining written informed consent and adhered to the latest version of the Helsinki Declaration.

The distribution of pain scores across the 24 assessment points is presented in Figure 1.

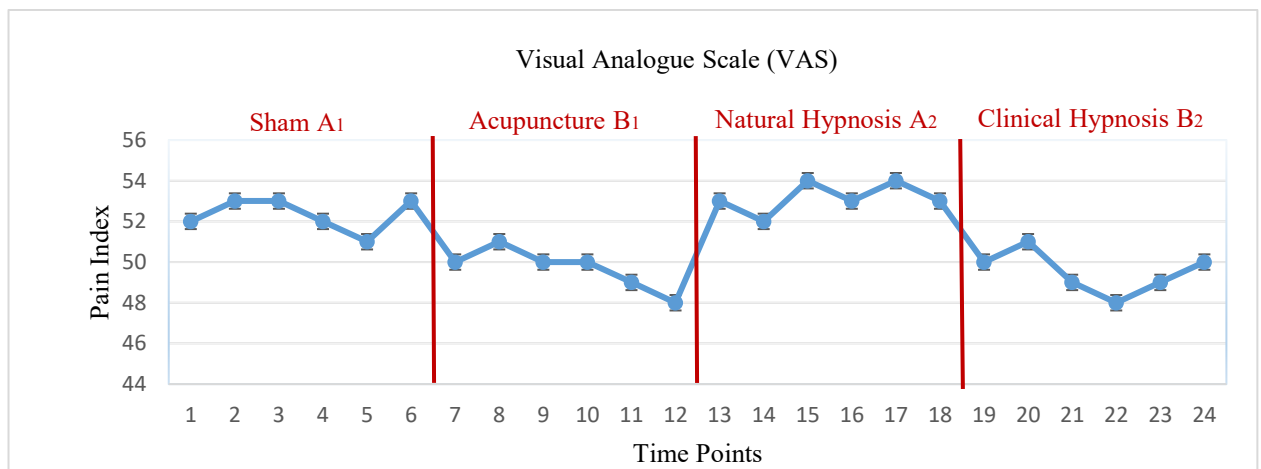


Fig. 1. Distribution of Pain Scores Across 24 Assessment Points

As shown in Figure 1, results from the generalized estimating equations analysis indicated a significant reduction in pain scores during both the auricular acupuncture (Phase B1) and clinical hypnosis (Phase B2) interventions ($p < 0.05$).

The distribution of anxiety scores across the 24 assessment points is presented in Figure 2.

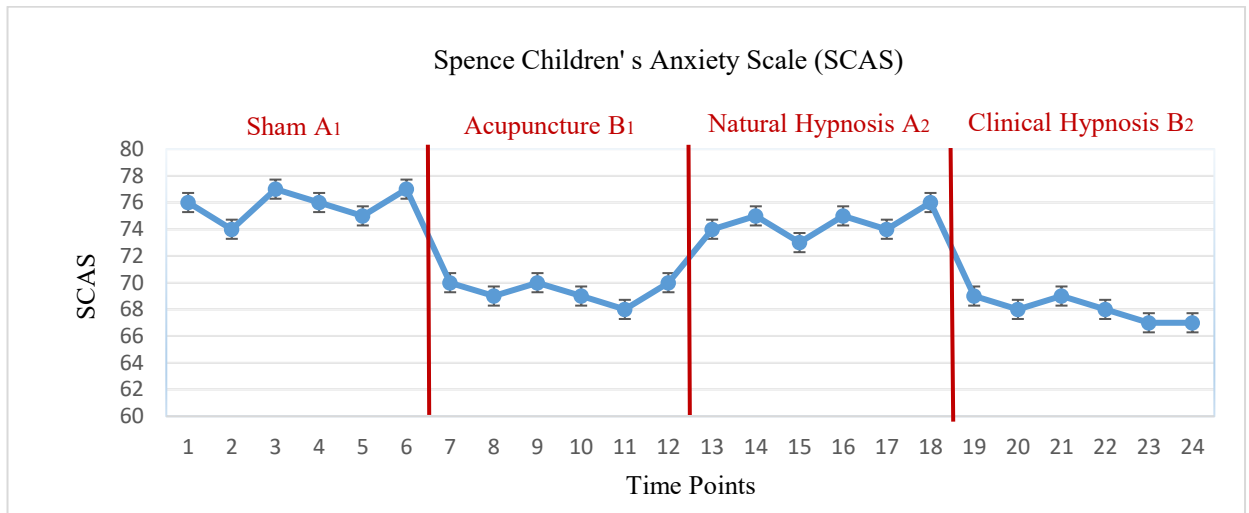


Fig. 2. Distribution of Anxiety Scores Across 24 Assessment Points

As illustrated in Figure 2, data analysis indicated a significant reduction in anxiety scores during both the auricular acupuncture (Phase B1) and clinical hypnosis (Phase B2) interventions ($p < 0.05$).

The distribution of salivary cortisol levels across the 24 assessment points is presented in Figure 3.

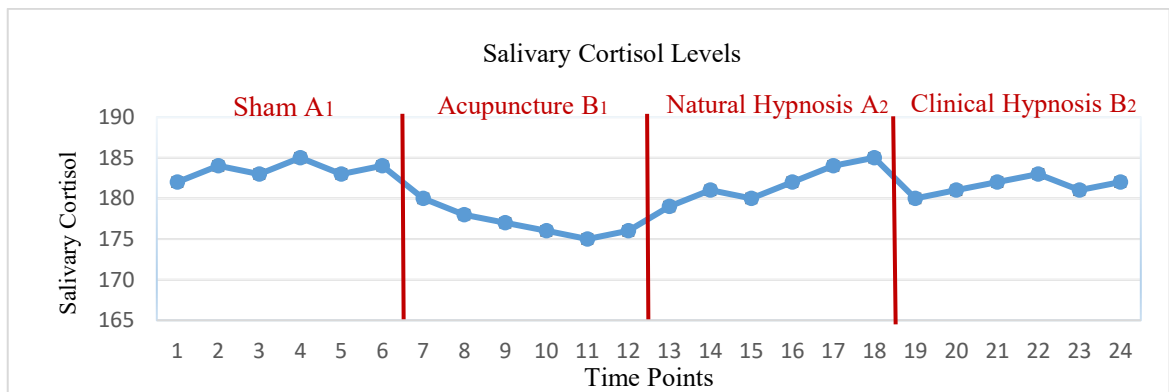


Fig. 3. Distribution of Cortisol Scores Across 24 Assessment Points

As shown in Figure 3, data analysis indicated a significant reduction in cortisol levels during the auricular acupuncture intervention (Phase B1) ($p < 0.05$), whereas changes observed during the clinical hypnosis phase (Phase B2) were not significant ($p = 0.93$).

Repeated-measures correlation analysis revealed a significant positive association between both pain and anxiety scores with cortisol levels.

$$(r_{rm} (1, \text{Cortisol- Pain}) = 0.79, 95\% \text{ CI } [0.86, 0.72], p < 0.01)$$

$$(r_{rm} (1, \text{Cortisol- Anxiety}) = 0.77, 95\% \text{ CI } [0.84, 0.71], p < 0.01)$$

3. DISCUSSION

The present study aimed to compare the effectiveness of auricular acupuncture and clinical hypnosis on pain, anxiety, and cortisol levels in a child with a burn injury. The findings indicated that hypnosis had a significant effect on reducing pain and anxiety, but not on salivary cortisol levels. Conversely, auricular acupuncture significantly reduced pain, anxiety, and cortisol levels. Additionally, results revealed a significant positive correlation between pain and anxiety scores and cortisol levels. The only significant difference between the two treatments was observed in the effect of auricular acupuncture on salivary cortisol. Although comparing the efficacy of the two interventions is a novel aspect absent in prior literature, numerous studies have investigated the effectiveness of each treatment individually.

Consistent with the present findings, Piroozi and Piroozi (2018) reported that auricular acupuncture significantly reduced pain in patients with lobular cancer. Similarly, studies by Piroozi et al. (a2018, b2018) demonstrated that auricular acupuncture significantly alleviated musculoskeletal pain in patients with trismus, aligning with our results. In contrast, Piroozi, Taheri-Namkhah, et al. (2017) found no significant effect of acupuncture on musculoskeletal pain, which contradicts our findings.

Furthermore, in line with our results, Piroozi et al. (2018) reported that four weeks of auricular acupuncture significantly improved mood symptoms. Other studies have also shown that cortisol levels are significantly associated with mood indices such as anxiety and depression (Piroozi, Janbozorgi, & Piroozi, 2017), although Piroozi, Givi, et al. (2016) reported this association as non-significant. Prior research also supports the efficacy of acupuncture in reducing cortisol levels (Piroozi et al., 2018). Specifically, acupuncture can modulate the HPA axis, enhance adrenocorticotrophic hormone function, and regulate cortisol secretion (Wei et al., 2017).

Our findings also indicated that clinical hypnosis reduced pain and anxiety. Consistent with this, Jafarzadeh et al. (2018) found that two sessions of hypnosis significantly decreased pain and anxiety. Moreover, a meta-analysis by Provençal et al. (2018) demonstrated that hypnosis effectively reduced pain and anxiety in burn patients. In contrast, Chester et al. (2018) reported no significant effect of hypnosis on pain reduction in children with burns.

However, our study found that hypnosis did not significantly reduce cortisol levels. Few studies have addressed this issue. In contrast, Chello et al. (2015) reported that hypnosis was associated with reduced cortisol levels. It appears that the mechanism of hypnosis, due to its unconscious nature, may target subcortical pathways, with biomarkers playing a minimal role. Nonetheless, this hypothesis requires confirmation through controlled clinical trials.

Several limitations were noted during the study. The participant was eight years old, an age associated with maximum hypnotizability, which may limit generalizability to adults. Additionally, natural hypnosis in this age group may not have functioned as a true placebo and may have contributed to the therapeutic effect. Finally, the use of corticosteroid-derived medications may have influenced perceived pain and anxiety, although the study design minimized potential bias. Future studies should investigate the comparative efficacy of these treatments in the framework of controlled clinical trials.

Transparency Statement

The data supporting this study are available upon reasonable request to the corresponding author, subject to ethical and confidentiality considerations.

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Declaration of Interest

The authors declare that they have no competing interests.

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