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VIRTUAL REALITY HYPNOSIS FOR PAIN ASSOCIATED WITH RECOVERY FROM PHYSICAL TRAUMA,[1,2]

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Abstract

Pain following traumatic injuries is common, can impair injury recovery and is often inadequately treated. In particular, the role of adjunctive nonpharmacologic analgesic techniques is unclear. The authors report a randomized, controlled study of 21 hospitalized trauma patients to assess the analgesic efficacy of virtual reality hypnosis (VRH)—hypnotic induction and analgesic suggestion delivered by customized virtual reality (VR) hardware/software. Subjective pain ratings were obtained immediately and 8 hours after VRH (used as an adjunct to standard analgesic care) and compared to both adjunctive VR without hypnosis and standard care alone. VRH patients reported less pain intensity and less pain unpleasantness compared to control groups. These preliminary findings suggest that VRH analgesia is a novel technology worthy of further study, both to improve pain management and to increase availability of hypnotic analgesia to populations without access to therapist-provided hypnosis and suggestion.

Pain resulting from bodily injury due to physical trauma is common, but its treatment, particularly with nonpharmacological approaches, is poorly understood. Acute pain naturally accompanies virtually every type of injury, such as orthopedic sprains, fractures, and dislocations, and is present in all patients hospitalized immediately following trauma, ranging from mild to severe. Postinjury pain has long-term effects and was present in 63% of a cohort of more than 3000 trauma patients at 1-year following injury (Rivara et al., 2008). Further, recent evidence suggests that inadequate early pain management after orthopedic trauma (Feldt & Oh, 2000) and burn injuries (Patterson, Tininenko, & Ptacek, 2006) contributes to less favorable long-term functional outcomes (e.g., functional outcomes, psychological adjustment, quality of life), adding further support for the need to develop and provide effective pain therapies for this large population.

In very general terms, there are two types of pain in victims of bodily injury during the immediate days to weeks following their trauma. *Background pain* refers to the pain experienced by the injured patient while he or she is at rest and is associated with the physical trauma itself. Background pain is usually constant, typically diminishes with time and is exemplified by the pain that accompanies a fractured bone. *Procedural pain* refers to that which results from brief medical treatments related to the injury. Procedural pain can be

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severe—but is usually of short duration—and is exemplified by the pain associated with the initial physical manipulation of a broken bone to align (i.e., set) the fracture prior to casting. Both types of pain are very common in individuals who have been hospitalized as a result of traumatic injuries. Procedural pain can be difficult to predict and treat in trauma patients, because therapeutic medical procedures tend to be intermittent and highly variable. However, background pain can be more easily addressed because of its more constant and less variable nature.

There are a number of important reasons to justify adequate treatment of pain experienced by hospitalized patients with traumatic injuries. First, poorly treated pain can be a source of distress and intense misery for patients (Melzack, 1990); i.e., the principals of beneficence and nonmalfeasance in medicine dictate that pain relief should be an important priority for heath care workers. Second, poorly treated pain has been shown to be associated with cardiovascular and immune system dysfunction (Kehlet, 1997), and there is evidence that adequate pain management may facilitate long-term healing and recovery (Patterson, Tininenko, et al., 2006; Ptacek, Patterson, Montgomery, Ordonez, & Heimbach, 1995). Last, there is evidence that treating acute pain effectively can result in substantial reductions in medical costs (Lang & Rosen, 2002; Montgomery et al., 2007).

Opioid analgesic medications continue to be the treatment of choice for trauma-related pain (Patterson & Sharar, 2001). However, several drawbacks accompany the use of these analgesics and necessitate the development of alternative pain treatments. For example, opioid analgesics do not adequately control all pain problems in all patients. Further, extended use and high doses of opioid analgesics can result in several adverse side effects including gastrointestinal, respiratory, and cognitive dysfunction, impaired patient-staff communication, masking of patient symptoms, and prolonged hospitalization.

Hypnosis is becoming increasingly recognized as an effective complement to (or even replacement for) opioid analgesics for pain management. A recent review of 17 controlled trials indicated support for the efficacy of hypnotic analgesia (Patterson & Jensen, 2003), and a meta-analysis of clinical and laboratory pain studies showed that roughly 75% of patients benefit from hypnotic interventions (Montgomery, DuHamel, & Redd, 2000). Although hypnosis has been reported to be useful to treat pain resulting from or associated with a number of acute clinical care problems (including cancer procedures, Hilgard & LeBaron, 1984; childbirth, Haanen et al., 1991; interventional radiology, Lang et al., 2000; acquired amputations, Chaves, 1986; Siegel, 1979; and the care of severe burn injuries, Gilboa, Borenstein, Seidman, & Tsur, 1990; Patterson, Everett, Burns, & Marvin, 1992; Patterson & Ptacek, 1997; Patterson, Questad, & Boltwood, 1987), to our knowledge, no controlled studies have been published on the use of hypnosis to treat pain associated with traumatic orthopedic injuries.

One reason that hypnosis is seldom used in trauma centers is the lack of clinicians who have the specialized training necessary to perform medical hypnosis. Health care professionals with extensive training in hypnosis are few and far between, and ones that have training in acute pain management are even more rare. For this reason, the use of new technology that can facilitate hypnotic analgesia may fill an important void in the field, if proven effective. Although technology cannot completely replace the finely nuanced, individualized hypnotic interventions necessary for psychotherapy with most Axis I and II disorders, treating pain from trauma is straightforward enough that standardized hypnotic interventions are likely to address the clinical needs of most such patients.

To test this hypothesis in the present study, we utilized a paradigm combining virtual reality (VR) and hypnosis. This approach relies on the use of immersive VR hardware and software

to provide a hypnotic induction followed by suggestions for comfort and pain relief. VR-based hypnosis (VRH) uses a high-resolution, head-mounted display that delivers absorbing visual images and high-fidelity audio that provide an induction (suggestions that the individual is "sinking" into the VR environment, while being cued with ordered numbers as a means to deepen his or her state of relaxation), followed by suggestions for comfort and pain relief (Patterson, Tininenko, Schmidt, & Sharar, 2004). Preliminary findings from a case report indicated that this approach may be useful for treating chronic neuropathic pain associated with spinal cord injury (Patterson et al., 2004). In this study, a patient with a high-level spinal cord injury and resulting neuropathic pain underwent 33 sessions of VRH over a 6-month period. She was also encouraged to practice self-hypnosis at home and was given an audiotape of the induction. This patient's ratings of pain intensity and unpleasantness declined by an average of 36% over the course of the treatment. Both a case report and subsequent case series indicate that the approach may also be useful for decreasing acute pain during burn wound care with VRH (Patterson et al., 2004; Patterson, Wiechman, Jensen, & Sharar, 2006). A total of 13 patients received virtual reality hypnosis prior to undergoing burn wound care. These patients reported an average 20% drop in worst pain scores from baseline to postintervention and a 29% drop in anxiety scores. Surprisingly, there was a 50% reduction in the amount of opioids required before, during, and immediately following wound care. Although compelling, these three reports are preliminary and anecdotal, given that control groups and randomized assignment were not used. Thus, VRH as a means to deliver hypnotic analgesia shows promise but lacks empirical rigor in outcome analyses.

In the current study, we applied a randomized controlled design to test the efficacy of VRH for the treatment of background pain in patients hospitalized for treatment of physical trauma (e.g., internal injuries, long bone fractures, gunshot wounds). Our primary study hypothesis was that trauma patients receiving standard analgesic care plus a session of VRH would report greater improvements in pain intensity and pain unpleasantness than those receiving either (a) standard care plus VR that does not include a hypnotic induction or suggestions for pain relief or (b) standard care alone.

Method

Participants

The participants for this study were 21 patients (17 [81%] males) treated at a major regional Level 1 trauma center. The average age was 31.8 years (range, 13 to 59 years; *SD* = 15.2). Eighteen (86%) of the participants were Caucasian and 3 (14%) were African American. The participants were admitted for a variety of traumatic injuries, including injuries caused by motor vehicle accidents, gunshot wounds, and other sources of trauma. The type and extent of injuries from these causes varied considerably and included long bone fractures, severe lacerations, and joint dislocations. In most cases, a single traumatic event resulted in several concomitant injuries (e.g., lacerations *and* fractures).

Study inclusion criteria included: (a) ages 12 years old or older; (b) ability to read and write in English; (c) no history of severe psychiatric disorders; and (d) ability to complete the study questionnaires. Exclusion criteria included: (a) inability to complete questionnaires due to impaired oral communication, traumatic brain injury, memory problems, or language barriers; (b) extreme susceptibility to motion sickness; (c) face/head/neck injuries precluding VR helmet or headphone use, and (d) seizure history.

Standard treatment for trauma consisted of surgery (e.g., repair broken bones, remove any foreign bodies, clean and suture lacerated skin) followed by recovery from surgery, additional surgery or surgeries as indicated, and discharge once all surgeries are completed

and the patient is able to take care of his or her wounds or injuries at home. Although having surgery was not an inclusion criteria for this study, the types of trauma admitted to this particular hospital almost always require that the patients have some type of surgical repair.

Measures

Pain intensity and pain unpleasantness were measured using 0–10 Graphic Rating Scales (GRSs). The validity of such subjective pain scales is supported through their association with other measures of pain intensity, as well as their ability to detect changes in pain over time (Jensen & Karoly, 2001). The GRS consists of a line, 100 mm long, with cross-marks in increments of 10 mm. Descriptor labels were associated with each mark to help the respondent rate each pain magnitude in each domain. For pain intensity, the GRS descriptors were *no pain*, *mild pain*, *moderate pain*, *severe pain*, and *excruciating pain*. For pain unpleasantness, the GRS descriptors were *not unpleasant at all*, *mildly unpleasant*, *moderately unpleasant*, *severely unpleasant*, and *excruciatingly unpleasant*. Participants were asked to mark a position on the line that best represented their pain intensity or pain unpleasantness (they were allowed to draw a line anywhere along the 100 mm line). Three temporal domains of pain intensity were also assessed: (a) current pain intensity; (b) average pain intensity over the past 8 hours; and (c) least pain intensity over the past 8 hours.

Procedure

Study participants all received standard analgesic care (typically a combination of oral and/or IV opioids and benzodiazepines) under the direction of their trauma care providers who were unaware of randomized group assignments. In addition, subjects were randomized to one of three treatment groups: (a) VR with posthypnotic suggestions (VRH) for pain reduction/forgetting about the pain, emotional calm, improved sleep, recalling positive experiences, and looking forward to a better future; (b) VR distraction without hypnotic suggestion (VRD) to control for participation in a trial and receiving VR (i.e., no suggestions were made in this condition for any reductions in pain); or (c) a no treatment with VR control condition (NT) in which patients received standard analgesic care only.

VRH consisted of VR exposure with hypnotic suggestions. In the virtual world, the patient began by descending into an icy, arctic canyon, complete with starry sky above, gently flowing river below, and vertical canyon walls containing ledges and crevasses. Simultaneously, they saw the numbers 1 to 10 float by in order while the psychologist's voice prepared him or her for what he or she would next experience. As each number passed, the patient became more and more relaxed. After the numbers reached 10, the patient passed through a visible fog and into a lush virtual valley with a lake, a setting where the majority of the suggestions were given. The psychologist said things such as "You find that your entire body now just feels very, very good, not a care in the world, your whole body deeply, comfortably relaxed" and:

> I'm going to ask your mind to start going backwards in time. What you find will happen is that you will start getting images, feelings of pictures of some time in the past. Any image, picture, or feeling is perfectly fine as long as it is a positive one. You will only have positive experiences.

The psychologist then talked about the future, suggesting to the patent, "Imagine you will see yourself functioning very well. You will be happy. Your pain will be well controlled. You will be sleeping well, and you will be completely healed." After completing this sequence, the patient was taken back through the fog to the same icy arctic canyon where the numbers begin counting from 10 back down to 1. At that point, the patient was awake and relaxed. Participants in the VRH condition received the 40-minute intervention at the same time of day (between 10:00 a.m. and lunch, depending upon their schedule and availability).

The VRD condition consisted of patients experiencing the same three-dimensional virtual icy canyon. However, instead of descending into the canyon, they wore a helmet with a head-tracking device that allowed them to slowly float through the canyon and interact with the world by targeting and shooting snowballs at objects such as snowmen, penguins, and igloos, while listening to soothing music. There were no posthypnotic suggestions. Participants in the VRD condition used the program for as long as they desired (usually 10–20 minutes) on a daily basis at the same time of day (in the morning before lunch).

Randomization was structured so that (a) all participants had the potential to be assigned to each of the three experimental conditions, but (b) more participants would be enrolled in VRH than in VRD or NT, in order to ensure an adequate number of participants in the primary treatment condition of interest (VRH) for providing reliable estimates of treatment effects. The clinical nurses who provided patient care on the trauma unit were not aware of the condition assignment.

Of the 27 eligible participants who expressed an initial interest in participating in the study and who were assigned to one of the three treatment conditions, complete data were obtained from only 21, due to the complexities of performing research and collecting data in a trauma center where patient care is the first priority. For example, patients were sometimes asleep when it was time to collect posttreatment data, and research staff were instructed not to wake the patients. Similarly, patients were sometimes busy with activities associated with their clinical care, such as bathing or wound care, at the time when they would be scheduled to complete the outcome ratings. Of the 21 patients who provided complete data, 11 were assigned to the VRH group, 5 to the VRD group, and 4 to the NT group.

On the morning of study participation before 10:00 a.m., all participants were administered GRSs for current pain intensity, current pain unpleasantness, average pain intensity in the past 8 hours, and least pain intensity in the past 8 hours. VRH and VRD participants were then given 40 minutes of VRH or as many minutes as they wanted of VRD. One hour after completing VRH or VRD, these participants were then readministered the GRSs for current pain intensity and unpleasantness. NT participants were administered the GRSs for current pain intensity and unpleasantness at noon (just before lunch). Finally, all participants were administered GRSs for average and least pain (in the past few hours since the previous questionnaire) again in the afternoon, at approximately 4:00 p.m., depending on when the participants were available (e.g., awake and not busy with other activities associated with their care).

Data Analysis

There were only 5 participants assigned to the VRD control condition and 4 assigned to the NT control condition, which limits the power or ability to detect the hypothesized differences between the VRH condition and these control conditions. In order to increase our ability to detect possible differences between VRH and control participants, we elected to combine the control participants into a single group, after confirming that no significant differences in outcome between the two control conditions were observed. Therefore, we first compared the participants in the two control conditions with respect to pretreatment to posttreatment changes in pain intensity or unpleasantness. No significant differences emerged in these analyses, so the participants in the two control conditions were combined into a single control group to compare with the VRH group. We then performed a series of repeated measures analyses of variance for each outcome measure (GRS ratings of current, least, and average pain intensity, and pain unpleasantness) as the dependent variable, with time (pretreatment and posttreatment for current pain intensity and unpleasantness; pretreatment and evening for least and average pain intensity) and treatment condition (VRH versus control [VRD and NT combined]) as the independent variables.

Results

The mean GRS ratings for current pain intensity and pain unpleasantness for each treatment condition (VRH versus combined control) obtained in the morning and 1 hour after VRH and VRD (or at noon for the NT participants) are presented in Table 1. Consistent with the study hypothesis, significant Time × Treatment Condition effects emerged for both the pain intensity and pain unpleasantness ratings, with participants in the VRH condition reporting decreases in pain intensity and pain unpleasantness, between the pretreatment time point and 1 hour after VRH. In contrast, participants in the control conditions reported increases in pain scores between these same time periods. Although the pretreatment pain rating means appeared to be somewhat higher in the VRH participants than in the control participants, *t* tests comparing the pretreatment means indicated that the observed differences were not significantly different, $t(19) = 0.90$, $p = ns$ for the current pain intensity, and $t(19) = 1.24$, $p = ns$ for the current pain unpleasantness, indicating that the random assignment was successful.

The mean GRS ratings for average and least pain in the past 8 hours, obtained at pretreatment and then in the evening for all study participants are presented in Table 2. The same pattern observed for the current pain ratings emerged in these analyses, with pretreatment to evening-time ratings decreasing for the VRH participants and increasing for the control participants. The pattern of findings, as indicated by Time × Treatment Condition interaction effect, was statistically significant for the ratings of least pain intensity but not the average pain ratings.

Discussion

The findings from this preliminary, randomized, controlled study indicate that in patients with ongoing pain due to physical trauma and injury the addition of VRH to standard analgesic care results in reduced subjective pain at 1 hour and during the 8 hours following VRH, relative to standard analgesic care alone or combined with VR that does not include hypnotic induction and suggestions for pain relief. Overall, the findings suggest that VRH is a promising treatment for background pain associated with trauma and that more studies examining its efficacy are warranted.

To our knowledge, this is the first use of immersive VR to deliver hypnosis for treating background pain in hospitalized patients. Although modifications and advances in the hardware and software will likely occur (and may result in improved outcomes, see below), the findings from this study are encouraging in that we detected positive results in pain reduction using this technology. Success of VRH would potentially overcome one current barrier to the application of hypnotic analgesia (i.e., the lack of trained clinicians), allowing more patients to benefit from its use. In this way, an “automated” hypnosis delivery system that captures the patient’s attention and includes suggestions that are specific and effective for various types of pain could reach substantial numbers of patients in settings where clinical hypnosis is not available. Not only will it be important to continue to develop more sophisticated means of delivering hypnosis from a technological standpoint but also it will be equally necessary to use rigorous study designs that are similar or superior to that utilized in the present study.

There are a number of important limitations to consider when interpreting the findings of this preliminary study. Our small sample size limited the statistical power to detect significant differences. The small sample size also results in findings that are less reliable than those from studies with larger sample sizes. Despite this, statistically significant differences between the VRH and control conditions still emerged, suggesting that the

effects of VRH might be substantial. The stability of the effects found in this study need to be replicated in future research.

In addition, our analyses were limited to those subjects for whom complete data could be obtained. Performing clinical research in the inpatient trauma setting is challenging, as evidenced by the fact that several data points were missed in our subjects. It is possible that the findings from patients who did not provide complete data might vary in some systematic, but unknown, way from the findings from patients who did provide complete data. Future research should not only seek to obtain data from as many eligible patients as possible but also to assess descriptive data from all potential participants to help determine if there are any systematic differences between participants and nonparticipants (e.g., severity of injury).

In addition, we did not assess general hypnotizability in our study population and do not know if this variable moderated outcome. It is important to measure hypnotizability for theoretical purposes as well as to help determine if this variable might be useful as a screen for patients who might benefit most from the VRH intervention. Future research should seek to assess hypnotizability whenever possible. Another limitation is that this study examined the analgesic effects occurring after only a single session of VRH. Future studies will need to determine if the outcomes differ when VRH is administered over multiple sessions (e.g., on a daily basis, throughout hospitalization).

Despite the limitations of this preliminary controlled trial, the findings support the potential efficacy of VRH for posttrauma injury pain, given that we were able to detect significant analgesic effects with patients hospitalized for trauma. Although we do not advocate the replacement of opioid or other analgesics with VRH for all patients, we do advocate for maximum pain control and relief for all patients. Nonpharmacological pain management strategies can potentially contribute to this goal of multimodal analgesia. Although nonpharmacological adjunctive pain treatments have received very little empirical attention, such techniques may result in better pain control with fewer pharmacologic side effects and bode well for long-term patient outcome (Lang et al., 2000; Montgomery et al., 2000; Patterson, Tininenko, et al., 2006; Ptacek et al., 1995).

References

Chaves, J. Hypnosis in the management of phantom limb pain. In: Dowd, E.; Healy, J., editors. Case studies in hypnotherapy. New York: Guilford; 1986. p. 198-209.

Feldt KS, Oh HL. Pain and hip fracture outcomes for older adults. Orthopedic Nursing 2000;19(6):35–44.

Gilboa D, Borenstein A, Seidman D, Tsur H. Burn patients' use of autohypnosis: Making a painful experience bearable. Burns 1990;16:441–444. [PubMed: 2073343]

Haanen HC, Hoenderdos HT, van Romunde LK, Hop WC, Mallee C, Terwiel JP, et al. Controlled trial of hypnotherapy in the treatment of refractory fibromyalgia. Journal of Rheumatology 1991;18(1): 72–75. [PubMed: 2023202]

Hilgard, JR.; LeBaron, S. Hypnotherapy of pain in children with cancer. Los Altos, CA: William Kaufmann; 1984.

Jensen, M.; Karoly, P. Self-report scales and procedures for assessing pain in adults. In: Turk, D.; Melzack, R., editors. Handbook of pain assessment. 2. New York: Guilford; 2001. p. 15-34.

Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. British Journal of Anaesthesia 1997;78:606–617. [PubMed: 9175983]

Lang EV, Benotsch EG, Fick LJ, Lutgendorf S, Berbaum ML, Berbaum KS, et al. Adjunctive non-pharmacological analgesia for invasive medical procedures: A randomised trial. Lancet 2000;355(9214):1486–1490. [PubMed: 10801169]

Lang E, Rosen M. Cost analysis of adjunct hypnosis with sedation during outpatient interventional radiologic procedures. Radiology 2002;222:375–382. [PubMed: 11818602]

Melzack R. The tragedy of needless pain. Scientific American 1990;262(2):27–33. [PubMed: 2296714]

Montgomery GH, Bovbjerg DH, Schnur JB, David D, Goldfarb A, Weltz CR, et al. A randomized clinical trial of a brief hypnosis intervention to control side effects in breast surgery patients. Journal of the National Cancer Institute 2007;99:1304–1312. [PubMed: 17728216]

Montgomery GH, DuHamel KN, Redd WH. A meta-analysis of hypnotically induced analgesia: How effective is hypnosis? International Journal of Clinical and Experimental Hypnosis 2000;48:138–153. [PubMed: 10769981]

Patterson DR, Everett JJ, Burns GL, Marvin JA. Hypnosis for the treatment of burn pain. Journal of Consulting and Clinical Psychology 1992;60:713–717. [PubMed: 1383302]

Patterson DR, Jensen M. Hypnosis and clinical pain. Psychological Bulletin 2003;129:495–521. [PubMed: 12848218]

Patterson DR, Ptacek JT. Baseline pain as a moderator of hypnotic analgesia for burn injury treatment. Journal of Consulting and Clinical Psychology 1997;65:60–67. [PubMed: 9103735]

Patterson DR, Questad KA, Boltwood M. Patient reports about their health and physical functioning three months after a major burn. Journal of Burn Care and Rehabilitation 1987;8:274–280. [PubMed: 3654716]

Patterson, D.; Sharar, S. Burn pain. In: Loeser, J., editor. Bonica's Management of Pain. 3. Philadelphia: Lippincot, Williams & Wilkins; 2001. p. 780-787.

Patterson DR, Tininenko J, Ptacek JT. Pain during burn hospitalization predicts long-term outcome. Journal of Burn Care & Research 2006;27:719–726. [PubMed: 16998406]

Patterson DR, Tininenko JR, Schmidt AE, Sharar S. Virtual reality hypnosis: A case report. International Journal of Clinical and Experimental Hypnosis 2004;52:27–38. [PubMed: 14768967]

Patterson DR, Wiechman SA, Jensen M, Sharar SR. Hypnosis delivered through immersive virtual reality for burn pain: A clinical case series. International Journal of Clinical and Experimental Hypnosis 2006;54:130–142. [PubMed: 16581687]

Ptacek JT, Patterson DR, Montgomery BK, Ordonez NA, Heimbach DM. Pain, coping, and adjustment in patients with severe burns: Preliminary findings from a prospective study. Journal of Pain and Symptom Management 1995;10:446–455. [PubMed: 7561227]

Rivara FP, Mackenzie EJ, Jurkovich GJ, Nathens AB, Wang J, Scharfstein DO. Prevalence of pain in patients 1 year after major trauma. Archives of Surgery 2008;143:282–287. discussion 288. [PubMed: 18347276]

Siegel EF. Control of phantom limb pain by hypnosis. American Journal of Clinical Hypnosis 1979;21:285–286. [PubMed: 474456]

Table 1

Means and SDs for the GRS Ratings of Current Pain Intensity and Pain Unpleasantness, Pre-VRH and Post-VRH, Relative to the Combined Control Conditions

Outcome variable	Condition	Pretreatment		1 Hour Posttreatment		Time × Condition Effect
		Mean	*SD*	Mean	*SD*	*F* (*df*)
Current pain intensity	VRH	48.33	26.23	38.33	28.63	4.88*(1, 19)
	Control	38.33	23.45	47.78	25.75	
Current pain unpleasantness	VRH	62.08	30.56	35.83	30.88	5.24*(1, 19)
	Control	46.67	24.37	51.11	33.05	

Note.

*$p < .05$.

Table 2

Means and SDs for the GRS Ratings of Average and Least Pain in the Past 8 Hours, Pre-VRH and Post-VRH, Relative to the Combined Control Conditions

Outcome variable	Condition	Pretreatment		8 Hours Posttreatment		Time × Condition Effect
		Mean	*SD*	Mean	*SD*	*F* (*df*)
Average pain intensity	VRH	55.00	28.44	41.67	23.29	2.64 (1, 19)
	Control	44.44	16.85	46.67	26.57	
Least pain intensity	VRH	21.67	20.82	13.33	20.15	6.82*(1, 19)
	Control	25.00	24.24	35.00	33.91	

Note.

*$p < .05$.