Memory Immersion Produces Reduction in Pain Perception

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Introduction

The experience of physical pain is known to be influenced by factors beyond the immediate pain-causing stimuli or stimulus. Self-regulatory strategies, anticipation of analgesia (placebo and expectancy), mood, and level of arousal have all been shown to modulate pain.

This study attempts to examine these elements separately through a two-part experiment. Experiment 1 assesses the effect of an embedded imagination and memory immersion exercise on thermal pain. This technique is used in the clinical practice of collaborators, Robert Bosnak, and Jill Fischer to treat both emotional and physical pain. It has yet to be tested experimentally.

In experiment 2, we used a novel treatment modality called Binaural Beats to attempt to induce a relaxed state in subjects similar to that in positive memory immersion. Binaural beats are a perceptual phenomenon occurring when two slightly asynchronous tones are delivered to the ears via headphones. The binaural beat is a phoneme frequency equivalent to the difference between the two carrier tones. Clomips have been used to modulate pain in binaural audio and can have anti-inflammatory effects, though some studies lend support to these claims. To test the efficacy of binaural beats, we controlled for expectancy by adding both Placebo and Holden Administration conditions.

Hypotheses

I. Subjects receiving Positive Memory Immersion therapy will report less pain than control subjects.

II. Subjects receiving binaural beats will report less pain than subjects not receiving the beats.

III. Reduction in pain from binaural beats is modulated by the expectancy of receiving the beats.

Manipulations

All subjects in both experiments 1 and 2 listened to white noise played through stereo headphones. Depending on the condition, the noise was either embedded with 100 & kHz tones (favoring a binaural beat - Open and Holden administration groups), or a 100Hz singular tone (no binaural beat - Control, Positive Memory Immersion, & Placebo groups). A microphone was connected through a filter so that the therapist or therapist could speak to the subjects through the headphones.

Positive Memory Immersion

A therapist-led subjects through a progressive body scan designed to produce a state of relaxation. Subjects were then asked to record and describe a positive memory. The therapist asks questions to foster further description of the subject's story, and provides helpful suggestions. In Positive Memory immersion, it is believed that subjects may dissociate from the immediate experience of pain focusing instead on the physical and sensory elements of the memory, thus forming a bridge with the pain perception.

Binaural Beats

Subjects in the Binaural Beats Therapy (BBT) conditions (Open and Holden Administration groups) listened to white noise embedded with 100 & kHz carrier tones delivered at each ear simultaneously, resulting in a perceived binaural beat equated in frequency to the theta waves (1-3Hz).

Expectancy

Subjects in the Expectancy (EXP) conditions (Placebo and Open administration groups) received additional instructions designed to enhance expectations of pain relief. These instructions were provided in a last-ditch undertaking the efficacy of Binaural Beats (BBT) as a non-pharmacological means of treating pain. Additionally, those subjects viewed a marketing video explaining binaural beats.

Methods

Experiment 1

Stimulation prior to manipulation as baseline test.

Memory Immersion subjects rated higher (p = .049) and high (p = .033) temperatures as less painful at line 2. Differences between controls at lower temperatures disappeared.

Experiment 2

Binaural Beats decrease pain after several minutes

Stimulation during Binaural Beats or brown noise.

Baseline pain ratings at lower temperatures were higher for expectancy groups (especially Placebo) (p = .108). No other differences were found at baseline.

Summary

In both experiments 1 and 2, novel non-pharmacological pain treatment modalities were examined and shown to be effective at reducing the experience of pain.

Positive Memory Immersion decreases pain and has increasing effects over time as compared to passive relaxation. However, the immersion process involves several components - the subject's intake of the medication, self-regulatory processes, and therapist rapport. Therefore, it is difficult to point to a clear-cut mechanism by which pain is reduced. This study attempted to control for relaxation with the addition of both Control and Binaural Beat groups. Further research on Positive Memory Immersion should be conducted with a variety of therapists while controlling for these other aspects as well.

In experiment 2, we found that, surprisingly, binaural beats may reduce pain at low to moderate levels of heat. This effect appeared to be independent of the enhanced experiences from the marketing video. The effect held over time. It is not clear why the expectancy effects were not observed in the placebo group. Further investigation is needed to determine whether binaural beats can affect the placebo effect.

References


* Positive Memory Immersion can significantly reduce pain even at high temperatures
* The pain reduction is greater than that for passive relaxation