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Role of relaxation and specific suggestions in hypnotic emotional numbing

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Abstract

The cognitive characteristics of highly hypnotizable subjects (Highs) allow them to easily modify their cognitive and autonomic state. Under hypnosis, Highs receiving cognitive, fear-like stimulation exhibit the cardiovascular changes typical of fear/stress, but also show an EEG pattern indicating a balance between fear-induced arousal and hypnotic relaxation. Indeed, hypnosis is effective in the attenuation of both emotional experience and behaviour (emotional numbing). The aim of the present experiment was to investigate the possible different role of relaxation and suggestion in hypnotic emotional numbing. Tonic skin conductance, respirogram, heart rate, systolic and diastolic blood pressure were recorded in 3 groups of hypnotized subjects: Group 1 received a fearful guided imagery associated with threat suggestions (Threat) followed by the same fearful suggestion associated with numbing instructions (relaxation and "No-Threat"); Group 2 received the same instructions in the opposite order of presentation; Group 3 received the fearful suggestion with threat instructions twice. The numbing suggestion reduced fear-related emotional experience and autonomic responses; if No-Threat preceded Threat, the heart rate, heart rate variability and blood pressure were also reduced during Threat, in spite of self reports of high negative emotion. Thus, 1) the subjective experience and the autonomic response to fear can be dissociated; 2) the efficacy of numbing suggestion is extended to a subsequent Threat stimulation; 3) habituation does not contribute to the numbing effect. The results indicate that the specific numbing suggestion is the main factor in hypnotic modulation of the experience of fear.

Keywords: Hypnosis; Suggestion; Relaxation; Negative emotion; Numbing; Autonomic activity; Humans

1. Introduction

Studies of the physiological correlates of hypnotizability show that this cognitive trait is associated with the ability to modulate the mind–body relationship depending on the specific instructions administered to subjects and on their state of consciousness. For instance, differential activation of the sensory motor areas and orbito-frontal/cingulated cortex of the brain was noted depending upon whether hypnotic suggestions were for decrease of the sensory (Hofbauer et al., 2001) or affective (Rainville et al., 1997; Faymonville et al., 2003) dimensions of pain. Suggestions of different pain-related emotions can also modulate the heart rate increase observed in hypnotized highly susceptible subjects (Highs) during painful stimulation (Rainville et al., 2005). Both cortical activities and autonomic responses are also modulated by suggestions of pleasant/unpleasant situations (Crawford et al., 1996; De Pascalis et al., 1989; Sebastiani et al., 2003a). In particular, hypnotized Highs performing guided imagery of a moderately unpleasant situation exhibit the autonomic reactions typically induced by aversive stimulation, namely acceleration of heart and respiratory frequency and increased tonic skin conductance; however, analysis of the EEG pattern revealed an increase of the relative powers of the frequency bands most associated with arousal (beta, gamma) without changes of the activity in bands classically considered indexes of relaxation (theta, alfa). This suggests a balance between the arousal induced by aversive suggestion and the relaxation associated with the hypnotic state induced by classical relaxation procedures. In contrast, when Highs were not hypnotized, guided imagery of the same moderately fearful situations induces the experience of fear but

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not the expected autonomic reaction (Sebastiani et al., 2003b), suggesting a hypnotizability-related buffering of the autonomic correlates of aversive stimulation. This hypothesis can be done because no suggestion of relaxation and/or emotional modification had been associated with the guided fearful imagery.

This buffering mechanism that might represent a natural protection against the autonomic effects of aversive stimulation is partially maintained in Highs affected by specific phobia. In these subjects, guided imagery of the phobic object induces autonomic activation, but it is less pronounced than in low hypnotizable individuals (Lows) (Gemignani et al., 2006). Hypnosis is commonly used in desensitization procedures (Spiegel et al., 1981; Crawford and Barabasz, 1993); indeed, the cognitive characteristics of Highs (Wolpe and Lazarus, 1966; Crawford, 1989; Crawford and Barabasz, 1993; Crawford et al., 1993;) allow them to experience suggestions quite like an in vivo exposure and to modify their autonomic responses accordingly (Sebastiani et al., 2003b; Santarcangelo and Sebastiani, 2004). Hypnosis is effective in the attenuation of both the behavioral (i.e. facial EMG activity) and experiential (i.e. self report of negative emotion) aspects of emotion (numbing) (Bryant and Kourch, 2001; Bryant and Mallard, 2002; Bryant, 2005). This numbing effect could be related to specific suggestions and/or to relaxation. Indeed, in phobia desensitization therapies, relaxation per se has been considered responsible for the extinction of the phobia (McGlynn et al., 1999); its effectiveness has been attributed to a reconceptualization of the phobic object due to changes in the central representation of the autonomic state induced by relaxation (Nagai et al., 2004). This can occur because autonomic changes are monitored by cortical areas involved also in the evaluation of cognitive activity (Critchley et al., 2002, 2004). In this way, central, top–down mechanisms and peripheral, down–top modulations can cooperate in the modification of both experience and behavior. This effect should be more marked in Highs, who are more able than Lows to modify the sympathetic–parasympathetic balance during neutral hypnosis (Santarcangelo et al., 1992; De Benedittis et al., 1994). However, the specific roles of suggestion and relaxation in hypnotic numbing have yet to be specifically addressed. Moreover, nothing is known about the "conditioning" power of emotional numbing during a subsequent fearful suggestion administered during the same hypnotic session. Only the efficacy of a post hypnotic suggestion of numbing has been studied (Weiss et al., 1987).

Therefore, the aim of the present experiment was to study hypnotic numbing in 3 groups of healthy hypnotized Highs each receiving a different series of stimulation during a single experimental session. Group 1 received a fearful guided imagery associated with threat suggestions followed by the same fearful suggestion associated with numbing instructions (relaxation and "no-threat"); Group 2 received a numbed fearful suggestion followed by a non numbed one. To exclude possible habituation/sensitization effects, Group 3 received two successive non numbed fearful suggestions.

2. Methods

Volunteers were recruited from a sample of 207 students (age 19–30) at the University of Pisa. The Italian version of the Stanford Hypnotic Susceptibility Scale, form C (SHSS, Weitzenhoffer and Hilgard, 1962), was used to measure their hypnotizability, and 26 healthy individuals with scores higher than 8/12 were enrolled in the study. After signing an informed consent document approved by a local Ethics Committee, each volunteer was interviewed to identify the unpleasant animal/insect that could arouse his/her most negative emotion (mostly spiders, bees, rats and snakes); he/she was then asked to make a subjective rating of its aversive value (range: 1, no fear — 10, fear corresponding to a real presentation of the object). The subjects included in the experiment reported similar fear scores for all the chosen animals (mean ± SD, 6.4 ± 0.8).

For the experimental sessions, the subjects were seated comfortably in an armchair in a semi-darkened and sound-attenuated room with the hypnotist sitting nearby. The session was preceded by 5 min of relaxation (with eyes closed) to obtain stabilization of autonomic parameters. The experimental paradigm included a standard hypnotic induction (SHSS) followed by two stimulation conditions (3 min, guided imagery of the previously selected unpleasant animal) each preceded by baseline periods (5 min, neutral hypnosis with suggestions of relaxation).

The subjects were divided into 3 experimental Groups (Fig. 1). In Group 1 (SHSS score 10.1 ± 1.52, $n = 8$, 5 females) and Group 2 (SHSS score 9.7 ± 1.34, $n = 10$, 5 females) the two stimulation conditions differed: in one condition, an explicit instruction to be threatened was given (Threat suggestion: "…. the situation is really unpleasant…. you cannot avoid the animal….it is nearer and nearer…..it is on you ….a very bad experience….), while in the other condition the fearful presentation was associated with the suggestion not to be threatened (No-Threat suggestion: ….the animal is here but you are absolutely calm and relaxed……it is nearer and nearer but you don't fear it……..nothing can disturb your relaxation……). In Group 1, Threat preceded No-Threat, while in Group 2 the order of the stimulations was reversed. In the control group (Group 3, SHSS score 10 ± 1.15, $n = 8$, 4 females), the subjects received two similar fearful stimulations (Threat1 and Threat2).

At the end of the experiment, all subjects were asked to score the Fear perception experienced during the two stimulation conditions (range 0–10, not unpleasant at all–extremely unpleasant/fearful).

ECG, respirogram, arterial blood pressure and skin conductance were continuously recorded throughout the session to evaluate stimulation-related changes in the autonomic output. For the ECG recording, Red DotTM Ag/AgCl disposable electrodes (3M) were placed according to the standard DII. The respirogram was obtained with a polymeric piezoelectric dc-coupled transducer wrapped around the chest (Pro-Tech), which measured the respiratory frequency (RF). Both signals were amplified (gain 1000; band pass 1–100 Hz; notch at 50 Hz) (LACE-Elettronica System, Pisa, Italy) and acquired on-line at 1 KHz (National Instrument A/D converter). The ECG signal was used to derive the series of the RR intervals as time intervals between successive R waves (tachogram). The RR series was used to provide the power spectral density via spectral density estimation by a Welch periodogram. It was evaluated on consecutive 128-beats (about 2 min) epochs. Two major oscillatory components are usually