Published in final edited form as:

Pain. 2007 December 5; 132(3): 281–288.

Revelation of a Personal Placebo Response: Its Effects on Mood, Attitudes and Future Placebo Responding

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Abstract

While ethics of placebo use has been debated since discovery of the phenomena, there has yet to be a study that examines the aftereffect of individuals learning of a personal placebo response on their future ability to experience a placebo response. In the first study, eleven participants diagnosed with irritable bowel syndrome in a placebo study were interviewed individually about their personal placebo response. We found no changes in attitudes about the likelihood of using medical and non-medical treatments for pain, likelihood of participating in future studies, or likeability and trust of experimenters. In addition, we found no changes in mood except for a slight improvement in frustration. In the second study, 77 undergraduate students from the University of Florida were divided into three conditions: placebo, control and repeated baseline. We used a double placebo design with verbal placebo suggestion and conditioning to induce a placebo response and to examine the effect of providing information about a participant's personal placebo response on their future placebo response. Using a heat thermode, we discovered that there were no differences in future pain responding between participants who were told that they experienced a placebo response versus those who were not. In addition, similar to the first study, we found no detrimental effects of the placebo information variables measured. These studies suggest the placebo response persists even after revelation of a personal placebo response and placebo use does not appear to cause adverse effects on mood and other attitude variables assessed.

Keywords

placebo; analgesia; expectation; ethics

INTRODUCTION

The ethics of placebo use has been a controversial topic since discovery of the phenomenon. Methodologically, the use of placebos is crucial. The randomized controlled trial is the closest that clinical research can get to the experimental situation (Stang, Hense, et al. 2005). The common argument against the use of placebo is that it is unnecessary, and treatments should be tested against existing treatments (Stang et al., 2005). However, "proven effective therapy" is often assumed and fails to show superiority to placebo (Stang et al., 2005). Without a placebo, it is impossible to make the distinction that two drugs are equally ineffective rather than equally effective.

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Much controversy regarding placebos revolves around the assumption that placebo effects are not real and that a placebo itself cannot effect true biological change. However, there is mounting evidence from imaging studies that placebos produce brain activation similar to that produced by known active treatments, such as placebo-induced activation of opioid brain circuitry (Amanzio & Benedetti, 1999; Ploghaus, Becerra, et al., 2003; Wagner, Rilling, et al., 2004).

These controversies are interesting in view of the surprising prevalence of the use of placebos in clinical practice. (Berthelot, Maugars, et al. 2001) interviewed 300 inpatients and 100 nurses about the placebo effect. Forty-five percent of patients and 66% of nurses reported that physicians should use placebos to treat their patients. Twenty-seven percent of patients believed the physician should tell their patients, only 3% of nurses thought the same. Twenty-eight percent of patients and 45% of nurses reported that they would agree to take a placebo. Nitzan and Lichtenberg (2004) surveyed 89 nurses and physicians about the use of placebos in their medical practice. They found that 60% used a placebo (53% of doctors and 71% of nurses). Of those who used a placebo, 94% reported that placebos were generally to occasionally effective. Also, 68% reported telling patients that they were receiving a real medicine, 17% said nothing at all, and 11% told the patients that they received a non-specific medicine.

In light of this known incidence of placebo use, concerns have been raised about using placebos as treatments, as they often entail deception. It has been suggested that patients who learn about deceptive placebo use could suffer disillusionment and harm, mistrust of future treatments, and reduced efficacy of subsequent treatments (American Pain Society, 2005). Although these concerns were directed toward clinical practice, some of them could apply to subjects of research experiments.

However, these concerns relate to three empirical and largely untested questions. Does learning that pain reduction is the consequence of a placebo treatment reduce responses to subsequent placebo treatments? Does it change attitudes about future placebo studies? Does it change mood and perceptions of the experimenter? The purpose of our two studies was to explicitly test these hypotheses in a clinically related context (study 1) and in an experimental paradigm (study 2). Study 2 employed repeat sensory testing after participants were informed about their previous placebo response, allowing for assessment of the effects of such knowledge on subsequent placebo responding.

MATERIALS AND METHOD

Both studies conducted were reviewed and approved by the University of Florida Institutional Review Board (IRB-02).

Study I

As a pilot study, participants from a previous placebo study were invited and interviewed to gauge the emotional impact of a revelation about a personal placebo response.

Participants—Participants diagnosed with irritable bowel syndrome (IBS) were recruited from a GI clinic at the University of Florida for an fMRI study using imaging to investigate the placebo effect (Price, Craggs, et al. 2006). To simulate clinical IBS pain, the pain paradigm used for this study was rectal insertion of a balloon that was then inflated. The participants participated in 3 separate days for natural history, placebo and placebo match conditions. Eleven participants who experienced a placebo response were invited back to participate in an interview.

Materials

Visual Analogue Scales of Mood (VAS - Mood): Mood was assessed with a mechanical VAS. The negative feelings associated with pain experience assessed were depression, anxiety, frustration, fear, and anger, with end points designated as “none” and as “the most severe imaginable”. Visual Analogue Scales (VAS) of pain have been demonstrated to be reliable, internally consistent measures of experimental pain sensation intensity (Wade et al. 1996).

Mechanical Visual Analog Scale (VAS): Participants rated stimuli using a mechanical VAS anchored at the left end by “no pain” the right end by “the most intense pain imaginable.”

Procedure—Patients were interviewed using both questions requiring numerical answers on the VAS and open ended questions. The interview was recorded using a tape recorder.

Pre-Information: The participant’s mood (i.e., depression, anxiety, frustration, anger, and fear) and attitudes (e.g., control over pain, trust in their physician, effectiveness of the treatment, willingness to treat pain with medical treatments, willingness to treat pain with non-medical treatments, and willingness to participate in another placebo-controlled trial) were assessed using the VAS.

Information: The participants were provided with information about their placebo response during their participation in the fMRI study (Price et al., 2006). Their results were presented in the form of a bar graph with two bars. One bar represented an average of their pain ratings during a natural history condition where participants knew that they were not receiving any medication. The second bar represented the participant’s average pain ratings when they were given a placebo and told, “the substance you’ve just been given has been shown to powerfully reduce pain in some people in previous studies”.

Post-Information: The participant’s mood and attitudes were again assessed using the VAS.

Study II

Participants—Seventy-seven participants, 41 female and 36 male undergraduate students from the University of Florida, were recruited via flyers and the college undergraduate subject pool. Before starting, all participants completed a consent form, which explained the nature of the noxious stimulation. Those with heart conditions, hypertension, diabetes mellitus, asthma, seizures, frostbite, past trauma to hands, lupus erythematosus, arthritis or those on pain medication were excluded from the study. Participants were told that they could withdraw from the experiment at any time.

Apparatus

Medoc Thermal Sensory Analyzer: All thermal stimuli were delivered using a computer-controlled Medoc Thermal Sensory Analyzer (TSA-2001, Ramat Yishai, Israel), which is a peltier-element-based stimulator. The stimuli were a range of temperatures from an adapting temperature of 33°C up to 51°C. Stimuli were applied in a counterbalanced order to the forearm by a contact thermode and were 3 seconds in duration. Multiple sites located on the forearms of both arms were employed. Stimuli presentations were timed such that no site was stimulated with less than a 3-minute interval to avoid sensitization of the site.

Mechanical Visual Analog Scale (VAS): Participants rated stimuli using a mechanical VAS anchored at the left end by “no pain” the right end by “the most intense pain imaginable.”

Placebo Cream: The placebo analgesic was in the form of a cream. A simple cold cream was mixed with linalol/oil of thyme in a ratio of 8:1, which gave the cream a distinct smell. The cream was removed with cotton. The control cream was an 8:1 mixture of cold cream and water.

Measures

Demographics Questionnaire: The demographics questionnaire provided information concerning the participants' sex, age, education, race, income, marital status, work status, occupation, height, weight, and pain conditions.

Visual Analogue Scales of Mood (VAS - Mood): Mood was assessed with a mechanical VAS. The negative feelings associated with pain experience assessed were depression, anxiety, frustration, fear, and anger, with end points designated as "none" and as "the most severe imaginable".

Procedures—All participants participated in four pain testing stages consecutively. Participants were divided into three groups: placebo informed, placebo uninformed and repeated baseline conditions. Figure 1 provides a brief overview of the difference in procedures between the three groups. The repeated baseline group was informed that they would be tested using a control cream that does not contain any active agents. They served as the information control receiving no information about any possible pain relieving effects of the cream. Both the placebo uninformed and informed groups were told that we are testing the effects of an ointment on pain and given the suggestion of an active agent. However, the placebo informed group was told after the first placebo testing stage that the cream used was a placebo while the placebo uninformed group was not told that the first cream used was a placebo. The following paragraphs provide a more detailed description of each stage.

Stage 1: Baseline: During the first stage, each subject began with the following instructions:

After filling out several questionnaires about yourself, your attitudes and your mood, you will be asked to participate in four sensory-testing sessions consecutively using a heat thermode where you will receive several brief heat pulses to different areas on your forearms. These pulses will range from undetectable to painful. After the first three sessions, you will be provided with information about your responses during the previous trials. After the information is provided, you will then be asked to participate in the last sensory testing session. After the last session, you will be asked to complete several additional questionnaires.

Half of the participants were randomly assigned to complete a packet of questionnaires including a demographics questionnaire (which asked for age, sex, education, marital status, ethnicity, occupation/area of study, socioeconomic status), while the other half were asked to complete the questionnaire at the end of the study. Also, VAS-Mood, likeability of experimenters and trust of experimenters were assessed in all participants before beginning the pain trials.

Next, calibration trials were conducted to control for individual differences in pain perception. For calibration, an ascending series of trials starting from 43°C increasing by steps of 1°C were completed. The participants rated the pain intensity immediately on a VAS following each trial. On a 0–10 scale, the temperatures at which the patient rated their pain intensity between 0 and 2 (placebo) and between 4–6 (control) were noted. For example, if a participant rated 44°C as 1 in intensity on the VAS and 46°C as 5 in intensity, during subsequent trials, 44°C and 46°C were used as the placebo and control temperatures, respectively. During the first stage after the calibration trials, each subject completed 4 pain-trials at the control stimulus intensity to determine their baseline pain ratings.

Stage 2: Conditioning and Suggestion: In stage 2, the subject in the placebo informed and uninformed conditions were provided with instructions regarding the nature of the experiment. They were told, “The agent you have just been given is known to significantly reduce pain in some patients”. They were also informed that the level of stimulation during this session would remain constant. On counterbalanced (left versus right arm, descending versus ascending, cream versus no cream) selected locations on the arm, each participant received 8 total pain-trials, 4 with the placebo cream at the placebo temperature and 4 at the control temperatures (as determined during the calibration trials) without the placebo cream. Eight trials were used because repeated pairings are necessary for conditioning to occur. Similar to the protocol used by Voudouris, Peck & Coleman (1985), the intensity of the stimulus was surreptitiously lowered for the placebo cream to produce the conditioning effect. Participants assigned to the repeated baseline condition were told that they would not receive an active agent during their participation. They were given 8 total pain-trials at the placebo temperature to prevent conditioning. Expected levels of pain intensity, measured on the same scale that was used to rate experimental pain, was assessed from all groups before this session and pain intensity ratings were assessed after each pain trial.

Stage 3: First Placebo: Participants in the placebo informed and uninformed groups were given 4 trials with the placebo cream. Pain intensity ratings were assessed after each pain trial. At the end of this stage, bar graphs of the pain responses were presented to the subject. In this graph, two bars represented the average pain ratings reported with the placebo cream and average ratings without.

Those in the placebo-informed group were told that they received a placebo cream and that the reduction in pain ratings with the placebo reflects their placebo response. Those in the placebo uninformed group were told that, as expected, the cream was successful in reducing their pain levels (or unsuccessful if a significant change was not observed). Those assigned to the repeated baseline condition were also provided with a graph of their pain ratings during the baseline and the first testing stage.

Stage 4: Second Placebo: Those in the placebo informed group were correctly told that they had received a placebo cream and would now receive the actual cream the study is testing. However, they again received the placebo cream. Those in the placebo uninformed group were told that the cream is being tested again, and again received the placebo cream. Those assigned to the repeated baseline condition were told that they would be tested again with the control cream. All groups again participated in 4 trials. Pain intensity ratings were assessed after each pain trial. Mood, trust of experimenters, and likeability of experimenters were assessed from all groups. At the end of this stage, the actual purpose of the experiment was explained to the participants in a debriefing.

RESULTS

Study I

T-tests—Paired sample t-tests for the eleven IBS patients did not show changes in attitudes, motivations about participating in future studies, trust in the physician, or willingness to be treated with medical or non-medical agents as a consequence of learning that they had received a placebo treatment. For the five pain-related emotions that were assessed, only frustration showed a significant decrease ($t=2.469$, $df=10$, $p<.05$). These results suggest that participants finding out about their own placebo response pose little psychological harm.

Study II

Verification of the Placebo Effect—The pain ratings from the repeated baseline group were compared to the pain ratings from the placebo informed and uninformed groups to verify that reductions in pain from the baseline to the first and second placebo testing were the result of the placebo manipulation and not simply habituation with time or repeated testing. To assess this possibility, the pain ratings from the placebo uninformed and informed groups were collapsed and compared with the pain ratings from the repeated baseline group.

A mixed model repeated measures ANOVA, with time as a within subject factor (3) and group as a between subject factor (2) was performed. Results indicated a significant main effect for group ($F(1,75)=565.957, p<0.001$), and for time ($F(2,150)=20.042, p<0.001$), and a significant time (baseline, first testing, second testing) by group (placebo informed plus uninformed and repeated baseline) interaction ($F(2, 150)=5.379, p=0.006$). Decomposition of the interaction revealed that the main effect for time was not significant for the repeated baseline group ($F(2,32)=2.512, p>0.05$, partial eta squared=0.136) whereas it was significant for the collapsed placebo informed and uninformed groups ($F(2,118)=47.417, p<0.001$, partial eta squared=0.446), confirming that the change in pain ratings were, for the most part, the result of our manipulation. The effect size (Cohen's d) for the change in pain ratings from the baseline to the first placebo was 0.99 for the collapsed placebo informed and uninformed group whereas it was 0.29 for the repeated baseline group. (Figure 2)

The level of a participant's placebo response was calculated by subtracting their pain ratings at the first placebo testing from their pain ratings at baseline. Only those who demonstrated a placebo response (i.e., difference scores > 0) were included in the following analyses. Fifty participants out of the total 60 tested in the placebo informed and uninformed conditions fit this requirement.

Pain Ratings—We wanted to determine whether there was a difference in the placebo effect between the placebo informed and uninformed groups at the first placebo (after conditioning) and second placebo testing (after placebo response information presentation). A repeated measures mixed-model ANOVA revealed a non-significant group (placebo informed and uninformed) by time (baseline, first placebo, and second placebo) interaction ($F(2,96)=0.218, p>0.05$). Test of within-subjects effects revealed a significant main effect across the three time points ($F(2,96)=99.699, p<0.001$). The pain ratings from baseline ($M=5.253, SD=1.283$) to first placebo ($M=3.289, SD=1.297$) decreased significantly ($F(1,48)=135.136, p<0.001$) whereas the ratings between first placebo and second placebo ($M=3.600, SD=1.457$) significantly increased ($F(1,48)=7.643, p=0.008$). Both post-placebo pain ratings differed from baseline and the two placebo effects were highly correlated ($r=.82, p<.001$). The test of between-subject effects showed that there was no significant overall difference between the two information groups ($F(1,48)=0.528, p>0.05$). (Figure 3).

Mood—A series of mixed-model ANOVAs was conducted to examine the time (pre and post) by group (placebo informed and uninformed) interaction and main effects for group and time for mood. No significant interactions were found for depression, anxiety, frustration, anger, or fear. A test of within-subjects effects revealed no significant changes for time in depression and anger from pre to post. However significant improvements (main effects for time) were found for anxiety, frustration, and fear. In addition, the main effects for group (placebo informed and uninformed) were not significant for depression ($F(1,48)=0.052, p>0.05$), anxiety ($F(1,48)=0.415, p>0.05$), frustration ($F(1,48)=0.955, p>0.05$), anger ($F(1,48)=0.596, p>0.05$), and fear ($F(1,48)=0.799, p>0.05$). These results show there were significant general improvements over time for anxiety, frustration and fear, but there were no significant group differences for any of the mood variables. (Table 2)

Attitudes—A series of mixed-model ANOVAs were conducted to examine the time (pre and post) by group (placebo informed and uninformed) interaction and main effects for group and time for the different attitude variables (the participants' likelihood of using medical treatments to treat pain, likelihood of using non-medical treatments to treat pain, likelihood of future participation in studies in general, likelihood of future participation in studies conducted in our lab, likeability of experimenters in general, likeability of experimenters in our lab, trust of experimenters in general, and trust of experimenters in our lab). No significant time by group interactions were found for any of the attitude variables. Moreover, a test of within-subjects effects revealed no significant main effects for time. Similarly, a test of between-subjects effects found no main effects for group in the participants' likelihood of using medical treatments to treat pain ($F(1,48)=1.004$, $p>0.05$), likelihood of using non-medical treatments to treat ($F(1,48)=1.758$, $p>0.05$), likelihood of future participation in studies in general ($F(1,48)=0.539$, $p>0.05$), likelihood of future participation in studies conducted in our lab ($F(1,48)=1.342$, $p>0.05$), likeability of experimenters in general ($F(1,48)=1.345$, $p>0.05$), likeability of experimenters in our lab ($F(1,48)=2.704$, $p>0.05$), trust of experimenters in general ($F(1,48)=10.93$, $p>0.05$), and trust of experimenters in our lab ($F(1,48)=3.427$, $p=0.07$). (Table 3)

Sex Differences—A 2×2 ANOVA was used to analyze whether there were any significant differences between men and women in their ability to get a first or second placebo response. The interaction between sex and information condition ($F(1,46)=0.119$, $p>0.05$) in the participant's ability to get a first placebo response was not significant. Additionally, there was neither a main effect for sex ($F(1,46)=0.779$, $p>0.05$) nor information group ($F(1,46)=0.411$, $p>0.05$). Similarly, the interaction between sex and information condition in the participant's ability to get a second placebo response was also nonsignificant ($F(1,46)=0.134$, $p>0.05$). Also, the main effects for sex ($F(1,46)=1.499$, $p>0.05$) and information condition ($F(1,46)=0.428$, $p>0.05$) were both non-significant.

DISCUSSION

The ethics of placebo use has been debated since discovery of the phenomena (Rohsenow & Marlatt, 1981; Kirsch, 2003). Under the heading, "No place for placebos when treating pain," Sullivan (2004) wrote, "this deception of the patient is damaging and unjustified." Alternatively, Oh (1994) concludes, "in appropriate patients, doctors might consider giving a placebo when active treatment is both costly and likely to confer only marginal or transient benefit." While neither extreme may be the answer, this debate has persisted without a good understanding of the result of placebo use.

In our first study, we found no detrimental effects on mood or attitude towards research when participants were told of their personal decrease in pain in response to a placebo. Anecdotal evidence from open-ended questions suggested that some participants understood their results as a typical response, others tried to learn from their experience, while still others tried to explain away their results. The strength of the first study was our use of clinical IBS patients with clinically relevant pain stimuli. However, in this first study, we did not examine the role of placebo response information on subsequent pain responding. The sample size in study one was also relatively small, though calculated effect sizes indicated that revelation of the placebo response yielded small effects.

In our second study, we used experimental heat pain stimuli to not only induce a placebo response, but to examine the effect of providing information to subjects about their own placebo response on future pain and placebo responding. We discovered that there was no statistically reliable difference in subsequent pain responding between participants who were informed that they responded to placebo versus those who were uninformed. Interestingly, the placebo effect persisted when a second placebo cream was applied even after participants were told that the

first cream used in the study was a placebo. Although the strength of that second placebo was slightly reduced, approximately 84% of the original placebo effect remained.

Both studies corroborated that revelation of an individual's placebo response does not appear to cause adverse effects on mood. In both studies, we found mood either did not change or slightly improved. It is possible the improvements in mood is a result of repeated testing or related to the participants' reaction to simply completing the study. If the improvements were related to procedures or information provided in the study, the exact nature and mechanism remains unknown. Nevertheless, the lack of worsening mood is notable.

Similar to mood, attitudes about the likelihood of using medical and non-medical treatments for pain, likelihood of participating in future studies, likeability of experimenters and trust of experimenters were assessed in both studies. Despite the level of deception involved, there were no significant changes in the first study and no differences between the placebo informed and uninformed groups in their attitudes in the second study. This suggests that participants may not change their attitudes about pain treatment, research participation or feelings toward experimenters after participating in a study involving placebo use with experimental pain. Moreover, attitudes seem unaffected by learning that the pain reduction reflected a placebo response.

The lack of differences in pain responding and in worsening mood has noteworthy implications for future placebo studies. These results suggest that placebo use in experimental settings may not result in detrimental effects. While our study demonstrated that a double placebo design is feasible to examine the role of a placebo use on a second placebo administration, we do not know the extent to which our findings will generalize to clinical settings. Furthermore, we found that the placebo effect slightly, but significantly decreased during the second placebo administration regardless of the assigned information condition. The reason for this is unclear. One possibility is that any information decreases the placebo effect. It is also possible that with time, the placebo effect will be reduced. If so, it would be important to explore the rate of decay and the variables related to this decay. A recent study (Colloca & Benedetti, 2006) demonstrated that the effects of a conditioning procedure may last days. How would the rate of decay be affected by personal placebo information? Such information may result in the development of protocols that maximizes the magnitude and longevity of placebo effects.

Conclusions

Our results provide evidence that informing patients of clinical trials and subjects of experimental pain studies about their placebo responses does not produce significant psychological harm nor does it significantly attenuate subsequent placebo effects. These findings are encouraging for the use of placebo groups in clinical trials and experimental laboratory studies. However, these findings may not generalize to the use of placebo agents in clinical practice. The ethical use of positive suggestions in clinical practice might be confined to enhancing the placebo components of active therapies, as we have maintained elsewhere (Vase et al., 2004).

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	Placebo Uninformed	Placebo Informed	Repeated Baseline
Initial information provided	Told “We are testing the effects of a cream on pain.”		Told “We will not be testing cream because you are in the control condition”
Questionnaire	Same for all groups		
Calibration trials	Same for all groups (testing temperatures determined with ascending series and reported pain)		
Baseline	Same 4 pain trials for all groups		
Conditioning	8 pain trials, 4 at placebo temp w/ cream, 4 at baseline temp		Also 8 pain trials, but with placebo temp on all areas
First placebo	Same 4 trials at baseline temperature		
Placebo information/ graph presentation	Graph Shown and told that the cream worked as expected	Graph Shown and told that they received a placebo and the difference in pain ratings demonstrates a placebo response	Graph shown and told that it represents their pain ratings at 2 time points (i.e., no information about placebo or drug)
Second placebo	Same 4 trials at the baseline temperature		
Questionnaire	Same for all groups		

Figure 1.

A brief summary of the protocol for the placebo uninformed, placebo informed and repeated baseline groups in Study II.

Figure 2. Verification of the placebo effect through a comparison of the pain ratings between the repeated baseline and placebo groups in Study II with standard deviations. The lack of a significant ($p < 0.05$) main effect for time for the repeated baseline group indicates that significant changes in pain ratings across time found for the placebo groups are most likely the result of our manipulations.

Figure 3.

Pain ratings at baseline, time 1 and time 2 for the placebo informed and uninformed groups in Study II with standard deviations. While we found significant ($p < 0.05$) changes across time between all time points for both placebo groups, we found no significant group differences between the placebo informed and uninformed groups at any time point.

Table 1
Change in attitude and mood variables after graph presentation of participants' placebo response in Study I.

Pair	Mean Difference	Standard Deviation	Eta ²	P-Value
Control Over Pain	−1.609	2.547	.30	.063
Willingness to Treat Pain with Medical Treatment	.455	1.462	.09	.327
Willingness to Treat Pain with Non-Medical Treatment	.373	2.014	.04	.553
Trust in Physician	.145	.702	.04	.508
Motivation to Participate by Compensation	.255	1.167	.05	.486
Motivation to Participate from Desire for Pain Relief	.473	1.487	.10	.317
Effectiveness of Treatment Received from Study	−1.127	4.000	.08	.372
Willing to Participate in Another Placebo-Controlled Trial	.309	1.203	.07	.414
Depression	.155	.685	.05	.471
Anxiety	.318	.883	.13	.260
Frustration	.736	.989	.38	.033*
Anger	.063	.284	.05	.474
Fear	.164	.359	.19	.161

* p<0.05

Mood mixed-model ANOVA results with time (pre and post) and group (placebo informed and uninformed) in study II.

Table 2

Mood	Time by condition interaction	Pre-post change (within subjects)	Pre	Post	Pre-post change (Cohen's d)
Depression	F(1,48)=0.761 p>0.05	F(1,48)=0.322 p>0.05	M=0.733 SD=1.630	M=0.690 SD=1.559	0.027
Anxiety	F(1,48)=0.501 p>0.05	F(1,48)=10.701 p=0.002*	M=2.078 SD=2.293	M=1.514 SD=1.952	0.265
Frustration	F(1,48)=0.076 p>0.05	F(1,48)=6.693 p=0.013*	M=1.696 SD=2.389	M=1.114 SD=1.917	0.269
Anger	F(1,48)=0.006 p>0.05	F(1,48)=.896 p>0.05	M=0.783 SD=2.006	M=0.639 SD=1.732	0.077
Fear	F(1,48)=1.667 p>0.05	F(1,48)=8.194 p=0.006*	M=0.997 SD=1.863	M=0.538 SD=1.463	0.274

* p<0.05

Table 3

Attitude mixed-model ANOVA results with time (pre and post) and group (placebo informed and uninformed) in study II.

Variable	Time by condition interaction	Pre-post change (within subjects)	Pre	Post
participants' likelihood of using medical treatments to treat pain	F(1,48)=0.423 p>0.05	F(1, 48)=0.929 p>0.05	M=3.907 SD=2.954	M=4.196 SD=2.826
likelihood of using non-medical treatments to treat pain	F(1,48)=1.357 p>0.05	F(1,48)=3.251 p>0.05	M=2.110 SD=2.881	M=2.528 SD=3.096
likelihood of future participation in studies in general	F(1,48)=1.067 p>0.05	F(1,48)=0.371 p>0.05	M=6.450 SD=2.594	M=6.312 SD=2.588
likelihood of future participation in studies conducted in our lab	F(1,48)=0.155 p>0.05	F(1,48)=1.897 p>0.05	M=5.641 SD=2.985	M=6.086 SD=2.922
likeability of experimenters in general	F(1,48)=0.403 p>0.05	F(1,48)=0.882 p>0.05	M=6.747 SD=2.226	M=6.926 SD=2.393
likeability of experimenters in our lab	F(1,48)=0.003 p>0.05	F(1,48)=0.456 p>0.05	M=7.915 SD=1.889	M=7.721 SD=2.047
trust of experimenters in general	F(1,48)=0.016 p>0.05	F(1,48)=.827 p>0.05	M=6.555 SD=2.400	M=6.367 SD=2.477
trust of experimenters in our lab	F(1,48)=0.914 p>0.05	F(1,48)=2.213 p>0.05	M=7.752 SD=1.941	M=7.472 SD=2.018