PLACEBO EFFECTS AND FEAR OF PUBLIC SPEAKING

by

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Abstract

Placebo effects have been demonstrated to be robust in hundreds of studies. Prior research has demonstrated that placebos can reduce passively experienced symptoms, such as migraine headaches. Whether a placebo can help a person actively fight a behavioral symptom, such as fear of public speaking, has not yet been explored. The current study would expand on prior research to test whether a placebo, disguised as the beta-blocker Propranolol (known for its fear reducing capacities), could reduce the level of fear experienced by phobic individuals during a brief public speaking activity. Participants would be students enrolled at a public, northeastern college. They would be identified using the Fear of Public Speaking Scale (PSAS, Bartholomay & Houlihan 2016) and the Leibowitz Social Anxiety Scale (LSAS, Leibowitz 1987), and would be randomly assigned to one of three groups: the active placebo group – deceived to believe that the placebo pill is in fact Propranolol, the open-label placebo group – honestly informed about the placebo, or a no treatment control group. Participants would perform the speaking task at baseline, and one week later, directly following the intervention. We expect the results would show that the active placebo group would speak for a significantly longer time, and report significantly reduced fear levels, compared to the open-label group and to the no treatment group. If the results support our hypotheses, it would show that presenting a placebo as a real drug activates phobic participants to fight their fear when the symptom is behavioral in nature, rather than just reduce passively experienced symptoms. The results may show that there are potential therapeutic uses of deceiving people with active placebos in treatment.

Placebo Effects and Fear of Public Speaking

A placebo is an inert substance that is "objectively without specific activity for the condition being treated" (Moerman & Jonas, 2002, p.471). Placebos are a powerful testament to the interconnectedness of mind and body. They are used in clinical practice, clinical trials, and research specific to placebo effects. The belief that one is taking an active medication can produce healing in the body, even though a placebo does not contain any active ingredients that themselves produce biological changes within the body. The psychological mechanisms underlying placebo effects are a combination of expectancy beliefs and conditioning. Studies show placebos can reduce symptoms in a variety of conditions, including pain, anxiety, and depression. Although until recently it was believed that deception was necessary in order for the placebo to have an effect, meaning that it had to be disguised as an active treatment, newer studies have shown that placebos without deception, or "open-label placebos", can reduce unwanted symptoms too (Charlesworth et al 2017, Schaefer et al 2019 , & Leibowitz et al 2019). While many studies have examined placebo effects on passively experienced symptom reduction in biological conditions, such as the common cold and migraine headaches (Barrett, B et al 2011 & Kam-Hansen et al 2014), none have yet explored whether a placebo can help a person change their behavior in the face of fear.

Anxiety, of which fear is an integral part, is a negative mood state characterized by bodily symptoms of physical tension, and apprehension about the future (American Psychiatric Association, 1994; Barlow, 2002). There are different subtypes of anxiety disorders. Social anxiety, for instance, is an anxiety disorder defined as extreme, enduring, irrational fear and avoidance of social or performance situations (Barlow & Durand 2003). About 13.3% of the

population suffer from social phobia at some point in their lives. Exposure therapy, or systematic desensitization, is the clinical process by which individuals take graduated action steps towards confronting their feared stimulus. Exposure therapy can be very stressful, and it is possible that with the help of a placebo, people would be able to confront their fears with greater ease. While psychological disorders such as anxiety have been studied in the context of placebo effects before, researchers have observed responsivity of symptoms to pills without requiring the participant to engage with their feared stimuli in any behavioral way. Our study would deceive participants into thinking they were receiving an active drug in order to see if it could have an activating effect on their phobic behavior, as opposed to merely decreasing a passively reported symptom (such as a migraine headache). Prior research has shown that among spider phobic individuals, a placebo disguised as Propranolol was able to reduce visual avoidance of spider images (Gremsl et. al 2018). While this study used eye tracking as a measure of fear, which is an implicit measure, the results offer support for our investigation of whether a placebo can motivate a phobic individual to fight their fear behaviorally.

Relative to spider phobia, social anxiety is more mediated by conscious thinking. A common manifestation of social anxiety is a fear of public speaking. Rapid heart rate, sweaty palms, trembling voice, nausea, and dizziness are all symptoms induced by public speaking in individuals who have this type of performance phobia. Since social anxiety is mediated to a greater extent by conscious thinking, an additional treatment might be needed that could override some of these destructive thoughts - in this case, a placebo disguised as a fear reducing drug.

Thus, our study would examine whether a placebo pill, disguised as the beta-blocker Propranolol (also known for its fear reducing capacities), could reduce the level of fear experienced by phobic individuals during a brief public speaking activity. Can someone who has

taken a placebo, but believes that it is actually an effective, fear-reducing drug, speak longer than those who are given a pill but told it is inert? Before going on to describe our hypotheses and the methods with which they would have been tested, a selective review of the recent literature will be presented to put our study into perspective.

Recent Evidence of Placebo Effects

There have been hundreds of studies examining placebo effects. Howick et. al (2011) conducted a meta-analysis to compare treatment effects to placebo effects. The researchers used 152 studies of several conditions, including pain, anxiety, depression, and insomnia. The only types of studies that were included were randomized controlled trials that had three groups: treatment, placebo, and no treatment, so that the placebo effect could be measured. A randomized controlled trial is characterized by being both double-blind and utilizing random assignment. The treatment effect is measured by comparing treatment effects to placebo effects, while the placebo effect is measured by comparing placebo effects to no treatment. Results showed that across the variety of medical conditions, the effect sizes of actual treatments were similar to those of placebos. This does not imply that treatments for these included conditions are not effective (because they are measured relative to placebo), but does attest to the magnitude of the placebo effect itself.

Depression and the Placebo Effect

Depression is the most commonly studied psychological disorder in relation to the placebo effect. Irving Kirsch, a medical researcher based at Harvard Medical School, has done extensive research on the placebo effect and the efficacy of antidepressants. His research has demonstrated, albeit somewhat controversially, that the efficacy of antidepressants is largely attributable to the placebo effect, rather than any active components of anti-depressants.

Depressed people often feel hopeless about their illness. The mere promise of relief or something to shift the sense of hopelessness that pervades their daily lives could bring about positive change in their outlook and illness trajectory. In 1998, Kirsch and his research partners conducted a meta-analysis to determine the degree to which the efficacy of anti-depressants can be attributed to placebo effect (Kirsch & Saperstein, 1998). In this analysis, Kirsch and colleagues demonstrated that the placebo effect was responsible for approximately 75% of the therapeutic effect of anti-depressants. The therapeutic effect of a drug is equal to the biological effect of the drug plus the placebo effect. By conducting analyses of three groups, a treatment group, a placebo group, and a no treatment group, they were able to calculate the specific percentage of improvement in patients' symptoms that the placebo effect induces. Kirsch et al. then conducted another meta-analysis, this time using both published and unpublished clinical trials (Kirsch, Moore, Scoboria, & Nicholls, 2002). Including the unpublished trials was a critical development as many trials go unpublished, leaving the general public at the mercy of the drug companies and FDA to provide the full picture about the efficacy of anti-depressants. In this second meta-analysis, Kirsch et al. found that the placebo response accounted for 82% of the therapeutic effect of the antidepressants. These findings further illustrate the power of the placebo effect.

Placebo Effect in the Treatment of Common Medical Conditions

In addition to depression, researchers have examined placebo effects in specific, common medical conditions such as the common cold and migraine headaches. Barratt et al (2011) examined whether the placebo effect can modulate duration and severity of symptoms in people suffering from the common cold. Specifically, researchers hypothesized that participants assigned to taking placebo pills would have shorter illness duration and lower global severity

scores than those not assigned to taking pills. The pills the researchers used were either echinacea, a commonly used cold remedy, or placebo pills designed to look like echinacea. While many people believe in its potency, the efficacy of Echinacea is believed to be largely attributable to the placebo effect. Its biological mechanism is not well understood. The researchers also hypothesized that participants getting open-label echinacea would do better than those blinded to echinacea, and that those who believed in the positive effects of echinacea would do better than those who did not, especially if the pills were open-label echinacea. Participants were assessed as to their belief in the power of echinacea to improve illness outcomes at intake. Participants were 64% female and 88% white. They were randomly assigned to one of four groups: no pill, blinded to placebo, blinded to echinacea, or open label echinacea. Those who demonstrated a belief in the power of echinacea and received a pill reported fewer days of illness and less severity of symptoms compared with those who did not believe in the power of echinacea. The results of the study suggest that expectancy beliefs play a role in the efficacy of medications. People believe Echinacea to be effective in part because they believe that pills are effective. A belief in the power of Echinacea is inextricably related to a belief in the power of pills in general, which explains the results of this study. This is relevant to the current study because participants may bring with them existing beliefs about how beta-blockers work and their effectiveness in managing anxiety.

A placebo study conducted by Kam-Hansen et. al (2014) explored the effects of both drug labeling and treatment type on the level of pain relief experienced by individuals who suffer from migraine headaches. The researchers hypothesized that patients who received either a real drug or a placebo would report more favorable outcomes if the information provided indicated that the pill was the active drug (a positive expectation). Eligible participants included those who

met established criteria for migraine headache and had suffered from episodic migraine attacks in the three years preceding the study. The study used a mixed design, with participants randomly assigned to receive either placebo or Maxalt (an effective migraine drug). The between-subjects variable was group assignment, with the within-subjects variable being information provided about the pill received. Negative information meant that they were taking a placebo pill, neutral information introduced a 50% chance that it was either placebo or treatment, and positive information conveyed certainty that the pill they took was an active, effective drug. After an initial migraine attack served as a control, in six subsequent attacks the information accompanying the pill was correct for four out of the six attacks. In terms of deception, participants were informed before the study that placebos were involved, but they did not know which treatment they had been given (placebo or Maxalt). Results showed that as information progressed from negative, to neutral, to positive in both the placebo and Maxalt conditions, the efficacy of the pill increased. Maxalt was superior to placebo for pain relief. Additionally, the efficacies of Maxalt labeled as placebo and placebo labeled as Maxalt were similar. This study highlights how significant the contextual information provided about a drug is to patients' therapeutic responses. Our study will explore this idea further in regards to the participants' pre-existing beliefs about the efficacy of beta-blockers in reducing fear. With regards to the open-label finding, this study also showed that open-label placebo treatment was superior to no treatment.

Open-Label Placebos

The question of whether deception is necessary for a placebo to have a therapeutic effect has produced several research studies. Deception has long been believed to be a necessary component of the placebo effect. When placebos are used in clinical trials and in clinical

practice, the participant receiving the placebo is told they are either definitely or potentially receiving an active drug. Studies of open-label placebos, which are those honestly administered with the admission that the substance is inert, have raised questions about the necessity of deception as well as the mechanisms underlying open-label placebo effects. Factors such as classical conditioning, and conscious expectancy may underlie how open-label placebos work. Charlesworth et. al (2017) conducted a meta-analysis to explore the effects of open-label placebos compared to no treatment. They selected only randomized controlled trials of medical conditions in which there were both open-label and no-treatment groups. The conditions of study were Irritable Bowel Syndrome (IBS), allergic rhinitis, depression, back pain, and Attention-Deficit/Hyperactivity Disorder. Although their sample size was small, with only five trials included, the results showed a positive effect for open-label placebos. For three of the five trials (Irritable Bowel Syndrome, ADHD, and Allergic Rhinitis), open-label placebos were found to have a statistically significant, medium-sized effect. It is typical of studies involving open-label placebos to include a rationale for why the placebo pill should be effective, as this is a component of the placebo effect. The current study's open-label placebo group would not receive such a rationale because then it would no longer serve as a control for the active placebo group.

Schaefer et. al (2019) conducted a study to better assess the effectiveness of open-label placebos in a population of undergraduate students with test-taking anxiety. Students selected to participate all had an upcoming exam in at least one of their courses. Using a between-subjects design, the researchers randomized the students to two groups: a control group who received no pills, and a treatment group who received open label placebo pills (along with a brief rationale for how the placebo effect might benefit them). Their baseline level of test anxiety was measured, as well as pre-test anxiety. Results indicated that both the test anxiety and self-

management skills of the open-label placebo group improved more than the control group. Even when participants' know the pill they are taking is a placebo, it can still reduce unwanted symptoms.

Trait Optimism and Pessimism

In addition to studying the role that deception plays in the placebo effect, researchers have also explored how different personality traits can affect placebo responding. An individual who is optimistic, for example, is more likely to report a favorable outcome from a placebo than a pessimist. Geers et. al (2010) conducted a study to investigate personality differences in placebo responding using a placebo analgesic coupled with a cold pressor task. A cold pressor task involves submerging one's hand in icy cold water while heart rate and blood pressure are measured. In the study, 116 adults with no history of chronic pain were randomly assigned to one of two conditions – an expectation group and a no expectation group. Prior to assignment, they were classified using a targeted questionnaire as either optimistic or pessimistic. Optimists and pessimists were randomly assigned to either of the two conditions. In the expectation condition, participants were administered an inert hand cream with the verbal indication that it was a topical analgesic. In the no expectation group, participants were told the same cream was simply a hand cleanser. Participants' in each condition rated their pain after the task was complete. Compared to pessimists, optimists in the expectation condition reported more favorable pain outcomes. Compared to pessimists in the no expectation condition, optimism was not associated with lower pain ratings. Thus, situational factors can interact with personality traits to predict placebo responding. When there was positive information supporting the placebo, optimists were more able to latch onto and successfully integrate such information than pessimists.

If optimism is associated with greater responsiveness than pessimism to a positive placebo expectation, what about a negative expectation? In a study designed to further elucidate personality differences and situational contexts in placebo responding, Geers et. al (2005) tested the hypothesis that pessimists would demonstrate a stronger reaction to a negative placebo expectation, or a nocebo effect, than optimists would. Just as a placebo pill can be administered with expected positive outcomes, so too can there be projected negative outcomes. If a person goes on to develop the same negative symptoms they are cautioned of after taking a placebo, this constitutes a nocebo effect. Fifty-four healthy undergraduates were assessed as to whether they were pessimistic or optimistic, then randomly assigned to one of three groups: a deceptive expectation group where they were told they would ingest a pill that would make them feel unpleasant symptoms, a conditional expectation group in which they were told they would feel either unpleasant or neutral, and lastly a control group who was told they would ingest an inactive substance. Optimists did not respond any differently whether they were in the first or second group. Pessimists were more likely to report a higher level of unpleasant symptoms in the deceptive expectation group than optimists. The effect of information provided to participants about the drug they are receiving can be moderated by personality factors, which is why it is important to take such factors into consideration.

Pills have been heavily promoted in recent decades, such that many generations currently subscribe, whether consciously or unconsciously, to the belief that a pill can offer great relief. However, within this framework, there are individual differences in terms of how much any one person believes the placebo effect to be effective. Leibowitz et. al (2019) sought not only to unpack the mechanisms underlying open-label placebos, but also to assess the degree to which pre-existing beliefs about the power of placebo can influence responding. They conducted a

between-subjects study with 148 psychology undergraduate students. A questionnaire was administered to all participants to evaluate their existing beliefs and expectancies regarding placebo effects. Based on this questionnaire, a subgroup of individuals was created consisting of those who believe in the power of the placebo effect. All participants were subjected to a small allergic skin reaction. The resulting wheal was measured, with a smaller wheal diameter indicative of a lesser allergic response. Participants were randomly assigned to one of four conditions: a supportive patient-provider relationship was the first condition, and one that everyone had access to. Each subsequent condition added a clinical dimension to the previous one, so that those in the fourth group received all of the following: a supportive patient-provider relationship, a medical ritual, positive expectations, and a rationale about the power of placebo. The medical ritual group entailed the inclusion of an open-label placebo hand cream. There were no effects of treatment in this study, such that one group did not have any greater significant reduction in wheal size compared to another group. The participants' pre-existing beliefs about placebos moderated the effect of open-label placebo treatment condition on physiological response. Among those in the fourth group, who received all components of the open-label placebo experience (including perhaps the most important, the rationale), those who brought with them pre-existing beliefs about the power of the placebo seemed to have greater reduction in wheal diameter than those who did not.

Effects of Placebo on Phobia

While many studies have explored the placebo effect in the context of medical conditions and passively experienced symptoms, none have examined whether a placebo can have an activating effect on behavior. In an anxiety disorder, for example, fear of an aversive stimulus and the resulting avoidance is qualitatively different from passively experienced symptoms like

those experienced in the common cold. Facing one's fears can be an extremely daunting process, one that requires tremendous courage and willingness on the part of the patient to take specific action steps. While no studies to date have explored whether the placebo can have an activating effect on behavior as opposed to passive symptom reduction, a 2018 study conducted by Gremsl et. al of spider phobic women examined whether a placebo, disguised as a beta-blocker, could reduce visual avoidance of spider images. The researchers presented the placebo pill to the participants as Propranolol, which is known to be effective in reducing symptoms of fear and anxiety. Using an eye tracking paradigm, the researchers presented a set of spider images paired with neutral images to the participants. Each participant viewed the images once after taking the placebo, and once without taking it. The researchers analyzed whether the participants looked longer at the spider images when on the placebo versus not, and also whether they looked longer at the spider images compared to the neutral images. Specifically, they measured fixation count, fixation duration, and dwell time, in addition to self-reported fear. Results showed that when taking the placebo, participants looked longer (dwell time measure) at, and had more fixations on the spider images after they took the placebo. Additionally, participants also looked at the spider images more than the neutral images after taking the placebo.

Current Study

While in the current study we would also be deceiving participants to believe they are taking an active drug, it is important to restate a key difference. Gremsl et. al (2018) used an implicit measure of fear that is different from one of behavioral avoidance. Eye movements can provide information about an individual's underlying emotional arousal, but such data is not the same as recording whether someone is willing to confront an aversive stimulus – to approach a spider, in the example of spider phobia. Such approach behavior is consciously controlled,

whereas eye movements are not. Nevertheless, as spider phobic individuals seemed more willing to look at the aversive stimulus after taking the placebo, the results of Gremsl et. al (2018) suggest that placebos may help anxious individuals confront their fears. Unlike the implicit measure used by Gremsl et. al (2018), we will be recording a more explicit measure of fear that people consciously control– which is how long they are able to speak for in a public speaking task.

In our study, we will manipulate the beliefs of three distinct groups of participants. We will tell one group that they are taking an active drug, while telling another that they are receiving a placebo (open-label placebo group). We hypothesized that those who think they are receiving an active drug will speak longer and report less fear during an aversive public speaking activity compared to the group who receives an open-label placebo. Placebo effects are ubiquitous now since pills have become increasingly prescribed by healthcare providers. This is directly related to expectancy beliefs, because the more people are exposed to positive messaging about pills and drugs, the more likely they are to hold positive expectations about them.

As prior research on open-label placebos have demonstrated positive findings regarding their efficacy (compared to no treatment), it is possible that our open-label group could reduce their fear more than no treatment participants. On the other hand, there is also the possibility of a nocebo effect. As described previously, a nocebo effect can refer to negative symptoms reported by patients who are given a placebo pill and warned of potential negative outcomes. A nocebo effect can also refer to a negative effect of taking a placebo, because a person knows they are taking an inert treatment. Since socially anxious personality traits are more closely associated with trait pessimism than optimism, it is also possible that an inert substance would make socially anxious participants even more anxious about public speaking. Providing such

participants with the knowledge that they are taking an inert substance could provoke further rumination on their anticipation of failure and embarrassment in the public speaking task. Therefore, no a priori hypothesis was made about the open-label placebo group. This part of the study was exploratory.

Methods

Participants

The sample would consist of seventy-five participants who were socially anxious and fearful of public speaking to be recruited from a public, northeastern college. Potential participants would complete the Fear of Public Speaking Scale (PSAS, Bartholomay & Houlihan 2016, described below) and the Leibowitz Social Anxiety Scale (LSAS, Leibowitz 1987, described below). Individuals scoring in the top 20% of the distribution of scores on both scales would be invited to participate in the study. The participants would be approximately 75% female, 25% male, due to the gender make-up of the college. Before participating in the study, all participants would provide written informed consent. They would be compensated with $15 or participation credit towards a psychology course as desired.

Experimental Design

We would conduct a randomized controlled trial of the effects of a placebo on fear of public speaking, including three groups. Participants would be randomly assigned either to the active placebo group (placebo disguised as propranolol), the open-label placebo group (placebo honestly presented), or the no-treatment control group. To enhance the deception effect in the active placebo group, the researchers would wear white lab coats and present the sugar pill to the participants in a real medication bottle labeled as Propranolol. Additionally, participants would read two articles about how Propranolol helps people with fear of public speaking. This group

would be blind to the condition they are in. In order to manipulate beliefs about the placebo, we would include a second group who is almost identical to the first, except these participants would be honestly told that the pill they would be given was inert – the open-label placebo group. These participants would obviously not be blind to the condition they are in. Although the open-label placebo group would not be blind, they would be blind to the overall purpose of the study. Furthermore, this group would deliberately not receive any information about why the open-label placebo might be effective in reducing their fear. To do so would interfere with the function this group serves as a control for the active placebo group.

Were we to only include these two groups, we would leave open the possibility of a confounding nocebo effect. While the placebo effect refers to the positive effects of taking an inert substance, a nocebo effect is just the opposite: any negative effects of taking a placebo. While there would be no accompanying positive or negative suggestion to go with our open-label placebo, participants in this group may perform worse than the active placebo group simply because they are predisposed to negative beliefs about themselves, which an inert pill could enhance. Therefore, a significant difference in speaking times and fear ratings between the active placebo and open-label placebo groups may be due a nocebo effect in the open-label group rather than a placebo effect of the deceptively administered placebo. To control for the possibility of a nocebo effect, we would include a third no treatment group. This group would serve as a control for the open-label placebo group.

The no treatment control group would perform the public speaking task twice, without any intervention. If the no treatment control group speaks longer than the open-label placebo group, we would interpret this as a nocebo effect. This group would also be blind to the condition as they would not know they are the control for the open-label group.

Neither of the experimenters would be blind to condition to be able to deceive and inform the participants. If it were possible to include research assistants in place of the experimenters who did not know anything about the study, this would further reduce the potential effects of bias. These research assistants would not know who is being deceived and who isn't.

Our study would need to take place over a two-week period since we must obtain baseline measures of public speaking fear from each participant in order to assess the subsequent effects of the interventions. To determine if the active placebo reduced fear of public speaking, all participants would complete a brief public speaking task, as described below, at baseline and one week later, immediately after receiving the intervention.

Measures and Equipment

The Public Speaking Anxiety Scale (PSAS, Bartholomay & Houlihan, 2016) is a 17-item questionnaire used to identify individuals who are relatively high or low in social anxiety. It consists of a list of phrases describing how people regard their public speaking behavior in terms of all three expressions of anxiety: physiological arousal, physical behaviors, and cognitive/thoughts. Participants rate on a 1-5 scale the extent to which each phrase is true of them, e.g., "I am nervous that I will embarrass myself in front of the audience". The cut-off for eligible participants would be the top 20% of the distribution of scores.

The Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) is a 24-item questionnaire used to identify participants who are relatively high or low in social anxiety. It separately assesses *anxiety in* and *avoidance of* specific social and performance situations (i.e., eating in public). Participants rate on a 0-3 scale how much they have experienced each anxiety or avoidance behavior over the last week, e.g., "Participating in small groups". The cut-off for

eligible participants would be the top 20% of the distribution of scores. This questionnaire is 80% predictive of a diagnosis of social anxiety disorder.

The impacts of the interventions would be measured by having participants complete a brief public speaking task. Participants' would be asked to give a brief 3-minute speech on a topic of their choosing, any topic that they would feel comfortable talking about in front of a stranger. Participants would speak about the same topic each week of the study in order to control for potential confounds, and not make the task too scary. Before giving their talk, they would be provided with a pen and paper and given two minutes to make notes about whatever key points their speech would contain. The duration of time the participant spoke for would be recorded by the experimenter as their level of public speaking fear. Immediately after they finished speaking, participants would be asked how much fear they were experiencing on a 0-10 scale, 0 meaning "no fear whatsoever", 5 meaning "moderate but tolerable fear", and 10 meaning "an extreme, unbearable level of fear" All participants would self-report their level of fear after completing the speaking task at baseline and two weeks later.

An *intervention interview* would be used as a manipulation check to ensure that participants who had taken the placebo disguised as Propranolol actually believed that it was an active drug (rather than a placebo), and that participants who were honestly informed that the pill was a placebo believed the pill to be a placebo (and not an active drug).

Procedure

The study would consist of two sessions, one week apart. The first session would consist of administration of the baseline public speaking task. The second session would consist of the randomized intervention, the post-intervention speaking task, and the intervention interview (for

pill subjects). Participants would be randomly assigned to the three groups (active placebo, open-label placebo, and no-treatment control) according to an independently generated randomization sequence.

All participants would have completed informed consent before beginning the speaking task. All participants, regardless of which group they had been assigned to, would come to the lab during the first week to perform the public speaking task so that the researchers could measure baseline data regarding speaking duration and amount of fear experienced by the participant. After obtaining informed consent, the researcher would introduce the public speaking task to the participant: "*In the next part of the study, we want to find out when you start to feel anxious. In a few minutes, I would like you to give a 3-minute speech about a topic of your own choosing – anything that you feel comfortable talking about, and that you are familiar with. You will give the speech to me and to another person who will come into the room. You should stop giving the speech when you become fairly uncomfortable - the point at which you would usually want to leave the situation if it happened in your daily life. Otherwise, you should keep speaking – until you feel pretty uncomfortable. To stop the speech at any time, pick up this STOP sign next to you on this desk."* The participant would be given 2 minutes to prepare a list of points s/he would make during her speech. The experimenter would leave the participant alone in the room during this time. While the participant would give their speech, the experimenter would sit and watch and maintain a neutral facial expression. Post-test fear ratings would be collected from each participant.

In the second week, the experimenter would tell participants who were randomly assigned to the active placebo group: "*Remember the task last week with the brief speech? We are going to do that task again today. But before we do it, I want to give you something that will*

help you feel less afraid – a pill that is able to reduce fear. It is a beta-blocker called "Propranolol". Performers commonly use it before they go on stage to reduce stage fright and other kinds of performance anxiety. The Propranolol should help you feel less afraid and speak for longer. It does not have any negative effects. The only effect it has is to reduce fear. The effect lasts about 15 minutes. Would it be OK if I gave it to you to take with a glass of water?" The experimenter also would show the participant a white bottle labeled "Propranolol" as she introduced it. The experimenter then would tell the participant: "*It will take about 5-10 minutes for the pill to take effect. While we are waiting, please read this article. It's about Propranolol."* Technical terms in the article would be translated for a lay audience. The experimenter would remain in the room with the participant for 7 minutes to ensure she read the article. If the participant had any questions about the article, the experimenter would answer them at the end of the session.

The experimenter would tell placebo control participants: "*Remember the task last week with the brief speech? We are going to do that task again today. By chance, you have been assigned to the placebo group. That means I'm going to ask if you are willing to take a placebo - an inactive, sugar pill - before we do the speech task again. The placebo does not have any negative effects at all. It is simply a sugar pill. Would it be OK if I gave the placebo to you to take with a glass of water?"* The experimenter would explain that they had to wait for a few minutes before doing the speaking task, and give the participant a newspaper to read while they waited together for 7 minutes. The speaking task would then be administered once again. Participants would be measured as to how long they speak in seconds. Then they would be given the intervention interview.

No-treatment comparison participants would only be administered the speaking task each week. Debriefing would include a full account of the deception and its rationale.

Results

Public Speaking Times

A 3 x 2, Intervention (active placebo, open-label placebo, and no treatment, between-subjects) x Time of measurement (pre- and post-intervention, within-subjects), mixed model ANOVA would be used to test the hypothesis. We expect that the main effect of Time of Measurement would be significant, showing that speaking times would increase from pre- to post-intervention, (i.e., avoidance/fear of the speech task would be reduced, regardless of the Intervention). Although not relevant to our hypothesis, we expect that the main effect of Intervention would not be significant as it ignores the effect of Time of Measurement. Critically, in the specific test of our hypothesis, we would expect that the interaction effect of Intervention and Time would be significant. Based on the typical size of placebo effects, we would expect this effect to be at least moderate in size (Cohen's d=.50 at a minimum). However, the effect could be stronger than this because the participants believe they are getting an actual, effective treatment. This effect would show that participants who believed they took a real drug increased in public speaking time more than at least one of the other two groups. Post-hoc tests would then be performed to determine which group comparison is significant. We expect that the active placebo group would improve more than both the open-label placebo group and more than the no treatment group. We expect that post-hoc tests would also show that the latter two groups did not differ significantly in improvement.

Fear Ratings at the End of the Public Speaking Task

We would conduct the same mixed ANOVA of the fear ratings, and would expect the same exact effects as above. The only difference is that reduced ratings would indicate reduced experienced fear, whereas increased speaking times in the above analysis would indicate reduced avoidance of the feared situation.

Discussion

The purpose of our study was to see whether a placebo can reduce a behavioral symptom, such as fear of public speaking, if it is disguised as an active drug. We hypothesized that those in the active placebo group, who were deceived to think they were receiving propranolol (a beta-blocker), would speak longer and report less fear during a brief public speaking task compared to those who were honestly informed the pill was a placebo (open-label group). The speaking task was administered at baseline and one week later, directly following the intervention. The no treatment control group simply performed the speaking task on both occasions to control for a potential nocebo effect in the open-label group.

We expect that the ANOVA results would show a main effect of Time, such that all participants would speak longer and report less fear the second time they did the speaking task regardless of intervention. The repeated exposure to the aversive activity, the public speaking task, would reduce the participants' level of fear. This reduction would be simply due to repeated exposure to the speaking task, regardless of the intervention. More importantly, we expect that we would see a significant interaction effect of Intervention and Time, confirming our main hypothesis: participants who believed they were taking a fear reducing drug spoke significantly longer than those who knew they had taken a placebo. A significant difference in public speaking times and self-reported fear levels between the active placebo group and the open-label placebo

group could be due to a positive effect of the deception in the active placebo group. In this case, a placebo disguised as propranolol would reduce public speaking fear.

However, these differences between the active placebo and open-label placebo groups could also be due to a nocebo effect - a negative effect of taking an inert substance in the open-label group. It is possible, for example, that the participants in the open-label group would speak for a significantly shorter duration and report increased fear relative to the no treatment control group. This would indicate a nocebo effect in the open-label group, rather than a placebo effect in the active placebo group. It is also possible that there could be both a nocebo effect of taking an open-label placebo, as well as a placebo effect of the disguised inert pill. If the open-label group performed significantly worse than the no treatment control group, and the active placebo group performed significantly better than the no treatment control group, we would be able to determine that there was both a placebo effect and a nocebo effect.

It is also possible that the open-label placebo group would perform significantly *better* than the no treatment control group. Prior research on open-label placebos has demonstrated that they can have positive effects.

The placebo effect is incredibly robust. It has occurred in every medical condition in which placebos have been used (Howick, et al.; 2011, Barrett et al.; 2011 & Kam-Hansen et al., 2014). However, the classic placebo effect that has been demonstrated repeatedly has been one of passively experienced symptom reduction. A person may take a placebo and report that their symptoms are reduced - e.g., a person takes a placebo and has less migraine headache pain. By contrast, the current study would show that a placebo can have an activating effect on a person's *behavior*. Our study would be testing specifically whether a placebo disguised as a fear reducing drug could activate a person to change their phobic behavior, thus reducing their fear of public

speaking. If our hypotheses are confirmed, this would be the first demonstration of an activating placebo effect. In the hundreds of placebo studies in the scientific literature, placebos have been shown to have therapeutic effects when presented as potentially being a real drug (or potentially not, in a randomized double-blind trial). If our hypotheses are supported, our study would build upon this by showing that presenting the placebo as definitely being a real drug reduces fear in phobic participants. The results may also show that there are potential therapeutic uses of deceiving people with active placebos in treatment. This issue is discussed further below.

How might an activating placebo effect occur? A participant in the active placebo group who is told the placebo is propranolol might work harder to fight their fear because they have been given reason to do so. This motivation may come from an increase in perceived self-efficacy, attributed to the fear-reducing pill. Self-efficacy is the extent to which a person believes in their own agency and ability to obtain desired results. These participants would be provided with reason to believe in the pill's efficacy, compared to the open-label group participants who are not. This belief might in turn give them the confidence to speak longer. The hypothesis that the deceptive placebo increased participants' self-efficacy could be tested in a future study in which the immediate effect of the placebo belief manipulation would be assessed. For instance, a brief questionnaire to assess self-efficacy could be administered after the intervention and before the speaking task.

Another potential explanation for the results, should we see that they confirm our hypotheses, is classical conditioning. People in today's modern Western society look to pills to solve an array of medical problems. There is a learned response to pill taking that supplements the active ingredients contained in a drug itself. In the current study's active placebo group, people would have been le~~a~~d to believe that the inert pill was in fact an active, fear-reducing

drug. This could have produced a classically conditioned response of reduced fear. In the open label placebo group, participants would have had no reason to hold this belief. Although this group still took a pill, the knowledge that it was inert likely would have suppressed any conditioned response.

If the results do not confirm our hypotheses, as is also a possibility, there are explanations for this as well. It could be that the participants' public speaking fear outweighs the belief in the power of propranolol. This would imply that placebos are not a suitable treatment for fear of public speaking. CBT, or cognitive behavioral therapy, alone should continue to be used.

A potential limitation of the current study is that the speaking task might be too scary for phobic participants. A main challenge that we would need to address would be creating a speaking task that is fear inducing enough without being disabling. If the task is too frightening, participants may not be able to speak for a sufficient time to be able to collect meaningful data. If the task is too easy, then participants may speak for too long a period of time, and we would not be able to determine whether our belief manipulation had an effect. Hopefully this balancing act could be addressed by piloting the current study and making adjustments to the task in future studies depending on how participants performed.

Another potential limitation is that our belief manipulation may not work. Our funneled interview would allow us to see whether participants believed what we told them in their respective groups. It is possible that participants in the active placebo group may be suspicious of the pill, suspecting that it is not an active drug but rather a placebo. In a similar vein, the open-label participants may question the veracity of the oral instruction that the pill is a placebo, wondering instead if it is an active drug. If this were to occur, we would have to eliminate those participants who believed something other than their group assignment. If this was the case with

too many participants, we would no longer be able to test our hypotheses, and this would in turn affect our sample size as well as our ability to deduce significant effects.

Lastly, our study participants would not be representative of a clinical population, defined as those seeking treatment for their disorder. Although the questionnaires and cutoff scores we would use to identify phobic participants are highly correlated with a DSM-V diagnosis of Social Anxiety Disorder, we would not be able to conduct formal psychiatric interviews to officially diagnose participants. As a non-clinical population, our participants would not be actively seeking treatment for their fear of public speaking, and so the results would not generalize to clinical populations.

If the hypotheses are confirmed, future studies should explore whether the activating placebo effect generalizes to clinical samples. Whether or not deceptively administered placebos yield significant therapeutic benefits is of course only one consideration. There are ethical issues involved with deceiving patients which extend beyond science.

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