2017

Using the Placebo Effect as a Potential Mediator for Stereotype Threat

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BUTLER UNIVERSITY HONORS PROGRAM

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Thesis title Using the Placebo Effect as a Potential Mediator for Stereotype Threat

Intended date of commencement
May 6th, 2017

Read, approved, and signed by:

Thesis adviser(s) _____ 5/1/2017
Date

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Date

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Certified by

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Using the Placebo Effect as a Potential Mediator for Stereotype Threat

A Thesis

Presented to the Department of Psychology

College of Liberal Arts and Sciences

of

Butler University

Nicholas Joseph Bryan Denney
May 3rd, 2017

Abstract

Previous research suggests that the placebo effect – the tendency for people to improve following a sham treatment – is pervasive in many contexts: people who expect to get better typically do regardless of the malady. Similarly, stereotype threat – the tendency for members of minority groups to demonstrate performance impairment when confronted with the stereotype – is also pervasive. While both phenomena are well-established and robust, no previous research has examined whether placebo can be used to limit the effect of stereotype threat. The present study seeks to do just that. By priming women in a laboratory setting to highlight the pervasive cultural stereotype that women are bad at math, and administering placebo medication, I hoped that I would find that the performance deficit experienced by stereotyped women was diminished. When the placebo treatment is applied, I hoped to counter the negative effects in conditions where both phenomena are present. The results of the study did not provide evidence to support my hypothesis; placebo effect does not appear to mediate stereotype threat.

Using the Placebo Effect as a Potential Mediator for Stereotype Threat

There has been a longstanding comprehension of the medical benefits of the placebo effect; if people are told they will get better following a treatment, their odds for improving are much higher (Kirsch & Sapirstein, 1998; Emslie, 1997). This has been a crucial component to medical and behavioral treatments for years. Kirsch and Sapirstein defined "placebo effect" as "a genuine physiological or psychological effect, in a human or another animal, which is attributable to receiving a substance or undergoing a procedure, but is not due to the inherent powers of that substance or procedure" (p. 326). Placebo trials are very wide ranging. There have been findings of improvement in Parkinson's Disease patients who use placebo equivalents of dopamine (Fuente-Fernandez, 2001). There have been studies involving treatment of bipolar disorder (Keck et al., 2000) and pain control (Sauro & Greenfield, 2005) where placebo treatments perform equivalently to "active" treatments. With such practical applications, it is evident that placebo trials are highly effective and necessary in combatting many ailments.

There is ample research that supports the fact that even when subjects know they are taking a placebo, they report symptom improvement (Miller, Colloca, & Kaptchuk, 2009). This illustrates the relative pervasiveness of the phenomenon: if you believe you will improve, you more than likely will experience a decrease in symptom intensity. This can be problematic when it comes to reporting improvement: typically, people are subject to response and co-intervention biases. Clearly, placebo effects are wide-ranging, strong, and pervasive (Hróbjartsson et al., 2011).

Stereotype threat is a widely accepted social psychological phenomenon. Seminal work on stereotype threat, done by Claude Steele (1997), defines the phenomenon as "a situational threat that, in general form, can affect members of any group about whom a negative stereotype

exists when the threat is made salient" (p.613). For example, there is a pervasive cultural stereotype that females are less mathematically capable than males. If female test-takers are alerted to this stereotype prior to taking a math test, their performance typically suffers relative to males and relative to females who are not primed with the stereotype. Steele noted a key condition that would amplify the effects: if the threat is experienced in the middle of a domain performance, such as during an examination, the emotional effects will hinder performance; in this example, cognitive energy, which should be directed towards the exam, will be expended on coping with the stereotype. The danger comes from realizing that the threat applies to the individuals because they belong to a minority group and the resulting concern that the expectancy could negatively influence their performance.

Research shows that no social minority is exempt from the consequences of stereotype threat; children and adults are both susceptible to its effects, and virtually every minority group can be affected. To illustrate this point, a group of researchers tested its effects on minority children, as most prior research had been done on adults (Galdi, Cadinu, & Tomasetto, 2014). The subjects in the study, first-grade children (143 of whom were girls), were assessed on both implicit and explicit measures related to social awareness, identification of themselves as part of a group, and their knowledge of their categorical assignment being due to specific domains or attributes. After priming the stereotype "girls are worse at math than boys," the researchers found a moderate negative correlation between the salience of the stereotype and the overall cognitive performance on math tasks in girls (r=-.267), with no significant performance inhibition in boys tested the same way. This illustrates how pervasive stereotype threat can be: stereotypes can victimize children who do not even realize that they are the targets.

Researchers are also interested in phenomena that could potentially limit the influence of stereotype threat. One such phenomenon is the self-affirmation effect, which maintains that a certain degree of self-integrity and self-worth is a strong source of human motivation (Martens et al., 2006). This requires a great deal of cognitive energy, especially because there is active processing of the stereotype; however, it certainly improves cognitive performance when compared to stereotyped groups. This implies that the amount of cognitive energy spent combatting stereotype threat and the amount of energy expended on self-affirmation is relatively equal, but multiple processes can be completed when self-affirmation occurs (Martens et al., 2006).

Clearly, the literature suggests that both the placebo effect and stereotype threat are well-established and robust phenomena. However, no study has looked at both phenomena in concert – can placebo be used to ameliorate stereotype threat? Addressing this gap in our understanding of both phenomena is the goal of the present research. By administering placebo medication to those who are primed to believe a negative stereotype, I hypothesized that their cognitive performance be improved; stereotyped individuals who also receive the placebo should be able to the same level as those in the control group where no stereotype is primed.

Method

Participants

The participants consisted of 21 female students at Butler University. Because the study focused on the priming of a female-specific stereotype, males were excluded from eligibility. 82% were Caucasian, accurately reflecting the population from which the sample was drawn. Three seniors, ten juniors, seven sophomores, and one first-year student were enrolled. Most

were psychology majors, but participants from other fields of study, including biology and theatre, participated.

Design and Materials

The present research was a 2x2 between-subjects experimental design. The first independent variable was the administration of the placebo, which was a "medication" that was espoused to enhance cognitive performance (in reality, a stevia extract solution). The second IV was the priming of the stereotype of men being superior to women at math. The primary dependent variables were the scaled and raw scores on the WAIS-III arithmetic subtest (Wechsler, 1997). Participants in placebo conditions were responsible for administering the placebo to themselves; researchers prepared the solution on a sterile q-tip, and participants were given the q-tip to place under their tongue. Participants in the priming condition were given a document detailing various studies that indicated men as superior in mathematics performance.

Procedure

Participants were recruited through campus advertising; psychology students were able to access Butler's extra credit system to sign up for the study. Students who were not enrolled in psychology classes were recruited via email announcements to student groups. Before arriving, participants were randomly assigned to one of four conditions: no placebo/no priming, no placebo/priming, placebo/no priming, or placebo/priming.

Upon arrival, participants went through the consent process (see Appendix). The nature of the study required deception: participants were told that Butler had been chosen to test a "new OTC drug that temporarily boosts cognitive performance" (in reality, a Stevia solution). Participants in the placebo condition administered the sham medication sublingually before proceeding. Following this, demographic information was collected, allowing time for the

"medication" to kick in. Participants in the conditions where stereotypes were primed were told that research has consistently found that men perform better in math than women. All participants were given the WAIS-III arithmetic subtest (Wechsler, 1997). Following this, participants were given additional measures (basic questions related to science and English), obtained through an online search, to complete. These were administered to ensure the effects of the priming and placebo were specific only to mathematics performance. Participants were given a full debriefing, including the opportunity to ask questions.

Results

Condition distribution is shown in Table 1. Prior to testing the main hypothesis of the study, a series of ANOVAs and correlation analyses were conducted to determine if any of the demographic variables significantly affected the dependent variables of performance on the arithmetic subtest (both raw score and scaled score). No significant relationships emerged, so no covariates were considered in the subsequent analyses.

Table 1: Distribution of participants in conditions.

Placebo	Primed	8 (38%)
	Not Primed	2 (10%)
No Placebo	Primed	7 (33%)
	Not Primed	4 (19%)

A 2x2 ANOVA was conducted to determine if condition affected the raw score of the WAIS-III Arithmetic subtest. As Table 2 indicates, there was no statistically significant interaction between conditions, nor were there any main effects. Means and standard deviations of each condition are outlined in Table 3.

Table 2: ANOVA Table for Raw WAIS-III Scores.

Source	*df*	*SS*	*MS*	*F*	*p*	*Eta squared*
Placebo	1	7.238	7.238	.821	.378	.046
Prime	1	2.887	2.887	.327	.575	.019
Placebo*Prime	1	.080	.080	.009	.925	.001
Error	17	149.929	8.819			
Total	20	159.81				

Table 3: Means and Standard Deviations of Raw Scores by Condition

Condition	*M*	*s.d.*
Placebo, Prime	15.5	3.5
Placebo, No Prime	16.5	2.12
No Placebo, Prime	14.3	2.5
No Placebo, No Prime	15	2.71

In addition, a 2x2 ANOVA was conducted to determine if condition affected the scaled score of WAIS-III. As Table 4 indicates, there was no statistically significant interaction between conditions, nor were there any main effects. Means and standard deviations are outlined in Table 5.

Table 4: ANOVA Table for Scaled WAIS-III Scores.

Source	*df*	*SS*	*MS*	*F*	*p*	*Eta Squared*
Placebo	1	3.388	3.388	.735	.403	.041
Prime	1	.722	.722	.157	.697	.009
Placebo*Prime	1	.020	.020	.004	.948	.000
Error	17	78.357	4.609			
Total	20	82.667				

Table 5: Means and Standard Deviations of Scaled Scores by Condition

Condition	*M*	*s.d*
Placebo, Prime	12	2.73
Placebo, No Prime	12.5	2.12
No Placebo, Prime	11.14	1.46
No Placebo, No Prime	11.5	1.73

In addition to the primary analyses, several secondary analyses were run in an attempt to further explore the data. Similar 2x2 ANOVAs were conducted using the secondary science and English measures as dependent variables. Results indicate that the assigned condition did not significantly influence science measure score [$F_{Placebo}(1,17) = 0.360, p = .556$; $F_{Prime}(1,17)=1.396$ $p =.254$; $F_{Placebo*Prime}$ $(1,17) = .119$, $p = .734$] or the English measure score ($F_{Placebo}[1,17]=1.313$, $p=.268$; $F_{Prime}[1,17]=.405$ $p=.533$;$F_{Placebo*Prime}$ $[1,17]=.187$, $p=.671$).

Discussion

The present study was an attempt to determine if the placebo effect could mediate stereotype threat effects. The present research found no significant results in any analysis. There were no significant effects of condition on arithmetic performance. There were also no significant effects of condition on the secondary measures of science knowledge or English vocabulary knowledge. Although there were no significant findings relating to placebo effect mediating stereotype threat in this study, we cannot draw conclusions based on the null hypothesis. We know only that this one study did not discover an effect; we cannot say that no effect truly exists.

Future Directions

Smaller university samples are often restricted in their ability to successfully represent a population. This research is no exception. Naturally, a larger sample size would be desirable, as the results of 21 participants are not powerful enough to discover a true underlying difference that may be very slight. In addition to a larger sample size, further diversification of the sample would prove more advantageous in answering present research questions. From the present study, we only know that there is no relationship in this very specific population. There is evidence to say that effects are not found in other populations.

A lack of variation in sampling in this study resulted in an increased likelihood of participants coming from the same sort of social background. The present sample was limited to college women who indicated a high level of functioning. Increasing and diversifying the sampling pool would make for stronger, more generalizable results.

In addition, it may serve better to utilize established science and English measures to act as secondary measures. In the current study, these were obtained through a quick online search,

and were adapted to fit the parameters of the research – they were intended to be distractor tasks and were not planned to be used as dependent variables.

Difficulties also emerged in the administration of the placebo. Participants in placebo conditions were asked to assess, on a 1-10 scale, how believable the placebo was; the average believability score was a 3.3 (SD= 1.1, Min = 2, Max = 5), meaning that participants were largely unconvinced. However, it is worth noting this information was collected post hoc, which created a very specific response set. Future research should include a generalized, more reliable and believable administration method; this could be as simple as having the researcher wear a lab coat..

Generally, stereotype threat is more salient with subtle priming; research shows that the subtler the priming, the more salient the stereotype becomes, therefore increasing its effect (Nguyen & Ryan, 2008). My priming document was very blunt (see Appendix). Taking a less direct approach in the future may yield better results. In addition, constructing a believability measure (i.e., how much do you believe this information to be true?) may increase participant stereotype identification.

Conclusion

The present study did not find evidence to support the hypothesis that the placebo effect can mediate stereotype threat-induced performance. As a novel study, no conclusion about the actual workings of these phenomena can be drawn; more research is needed. Furthermore, addressing the shortcomings of this study may lead to more significant results.

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Appendix

BUTLER UNIVERSITY CONSENT FORM

CONSENT BY SUBJECT FOR PARTICIPATION IN RESEARCH PROTOCOL

Research Project: **Open-Label Trial of a New Cognitive Enhancing Supplement**

Investigators: Nick Denney, Dr. Joel Martin

I, _____, hereby consent to participation as a subject in the above named research project, conducted under the direction of the above named persons at Butler University. My consent is given of my own free choice without undue inducement and after the following has been explained to me by the researcher. I have been informed that I will be one of approximately 100 subjects participating in this study.

---

1. Nature and Duration of Procedures.

Astrastar Health has developed a new sublingual administration of a commonly-used herbal supplement. The purpose of this study is to determine if this cognitive enhancing supplement is ready to be marketed. By participating, you are consenting to be a part of research that has not been previously documented.

GENERAL SUPPLEMENT AND PROCEDURAL INFORMATION:

- We are testing a new administration of an already-existing cognitive enhancing supplement. Prior to now, the supplement existed in a drinkable administration. However, preparations that are quicker-acting are desirable. Thus, the present study seeks to test a sublingual (under the tongue) administration.
- If you agree to participate, you will be randomly assigned either to receive the cognitive enhancer or not. This coin-flip was completed on your subject ID number before you arrived in the lab today.
- If you are assigned to the supplement condition, a drop of the supplement will be placed on a sterile cotton applicator (like a Q-tip) and placed under your tongue for 3 minutes. Because this administration is very fast-acting, peak cognitive enhancement will be evident at the end of this 3-minute interval.

GENERAL SAFETY INFORMATION:

- The supplement is available over-the-counter, and is considered safe by the FDA. However, there have been no reports of allergic reactions to the supplement, but of course an allergic reaction is possible for any substance. By agreeing to participate in this study, you assert that you have no known allergies or sensitivities to sulfa drugs (such as Bactrim or Septrim), or to the food additives/supplements St. John's wort, stevia, saccharine, or vitamin C. If you have a severe ragweed, chrysanthemum, marigold, or daisy allergy, do not participate in this study. Please do not participate in this study if you are currently taking St. John's wort, curcumin, vitamin C, MAOI's or cholinesterase inhibitors, or if you are pregnant or breastfeeding.

Whether you receive the supplement or not, all participants in this study will be asked to complete a short battery of tests related to general and specific knowledge.

This study is a one-time commitment. We anticipate all study procedures will be complete within roughly 30 minutes. You will be debriefed upon completion of the study.

2. Potential Risks and Benefits

As mentioned above, there have been no reports of mild allergic reactions to the supplement and the supplement is generally regarded as safe by the FDA. Any substance you ingest, however, incurs some small risk of allergy. The risk of allergic reaction is low, but if you experience such a reaction (swollen and itchy lips/tongue, shortness of breath), it is important that you seek emergency medical assistance as soon as possible by calling 911 or going to your nearest emergency room. Further risks of this study are also thought to be minimal. You may experience some discomfort due to disclosing personal information. Further, as will all studies where personal information is collected, there is the remote possibility of confidentiality breach. To minimize these risks: (1) your name will not be associated with the information you provide; rather, your information will be linked only to a randomly assigned code number; (2) you may contact the principal investigator (Dr. Joel Martin) if you have concerns; (3) you may contact Butler University's counseling center if you experience undue distress: Counseling and Consultation Services, HRC, Room 120 530 W. 49th St. Indianapolis, IN 46208, 317-940-9385.

Your participation in this project is entirely voluntary. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with any faculty at Butler University. Your decision will not result in any loss of benefits to which you are otherwise entitled. If you choose to participate, you may withdraw at any time by notifying the person administering the research session. Upon your request to withdraw, all information pertaining to you will be destroyed. If you choose to participate, all information will be held in strict confidence and will have no bearing on your academic standing or services you receive from the University. As with all research studies, we may withhold some information about the study and its aims until you have completed participation. The information obtained in the study may be published in scientific journals or presented at scientific meetings but your identity will be kept strictly confidential.

I have had the opportunity to ask questions concerning any and all aspects of the project and my questions have been answered. I understand that participation is voluntary and that I may withdraw my consent at any time without prejudice to me. Confidentiality of records concerning my involvement in this project will be maintained in an appropriate manner. When required by law, organizations may inspect and/or copy your research records for quality assurance and data analysis include groups such as the principal investigator and his research associates, the Butler University Institutional Review Board or its designees, the study sponsor, and state or federal agencies, specifically the Office for Human Research Protections (OHRP).

A copy of this written consent has been given to me. I understand that if I have any questions concerning this research, I can contact the Investigator stated below or the supervising faculty member at Butler University.

_____ _____

Signature of Participant Date

_____ _____

Signature of Researcher Date

Nick Denney, Student Researcher
Butler University
4600 Sunset Avenue

Joel Martin, PhD, Principal Investigator
Butler University
4600 Sunset Avenue

Indianapolis, IN 46208
317-459-3139; ndenney@butler.edu

Indianapolis, IN, 46208
317-940-9971; jmmarti1@butler.edu

For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or offer input, contact the Office of Butler Institute for Research and Scholarship at (317) 940-9766.

Demographic Questionnaire

Age

Ethnicity (select all that apply)

_____ African-American _____ Asian

_____ Caucasian _____ Native American

_____ Hispanic _____ Other (please specify)

Please list your Majors/Minors

Occupation/Year in School

Have you been diagnosed with any physical disorders? If yes, explain.

If yes, are you currently on any medication for a physical disorder?

Have you been diagnosed with any mental disorders? If yes, explain.

If yes, are you currently on any medication for a mental disorder?

Scripts

Script (No Prime, No Placebo)

Hello, and thank you for taking the time to come in and help with our research today!
I'm going to give you a copy of the consent form. Look it over carefully, and if you have any questions, please don't hesitate to ask. You have been randomly chosen to not receive the medication.

-waits-

Do you have any questions?
–answer what you can without giving away true purpose of the study-

Alright, now just to review what you're going to be doing here, I am going to be giving you a math test, and we're going to see how long it takes to complete it.
I am now going to administer the test. Please answer all questions, even if you are guessing (emphasize the importance of guessing if they don't know an answer).

-administer the test face down-

Please do not turn the paper over until you are ready. Do you have any last minute questions before beginning?
You may begin whenever you are ready.

-Begin timing as soon as they flip over the paper, and continue until the participant has put down their writing utensil-

-Debriefing upon completion-

Do you have any questions?

-answer anything they have at this point, administer compensation, thank them, and send them out-

Script (Priming)

Hello, and thank you for taking the time to come in and help with our research today!
I'm going to give you a copy of the consent form. Look it over carefully, and if you have any questions, please don't hesitate to ask.

-waits-

Do you have any questions?

–answer what you can without giving away true purpose of the study-

Alright, now just to review what you're going to be doing here, I am going to be giving you a math test, and we're going to see how long it takes to complete it. But before we begin, I want you to take a look at the results of studies involving general knowledge tests.

How do you interpret this?

DO…	DO NOT…
-Guide them to the conclusion that in general academic knowledge, men out perform women.	-Ask if they relate to the findings, as that could give them proof the stereotype does not apply to them.
-Emphasize the highlighted results on the table.	-Answer questions about the methods, procedure, etc. about the findings, as that is irrelevant.
-Reiterate the validity and evident generalizability of the studies; "look how many there are, this isn't an isolated finding" etc.	-Initially tell participants that they are less capable then men. We are creating an artificial scenario, we don't need to boost their self-esteem afterward.
-Let them come to the conclusion themselves.	-Tell them that they are misunderstanding when they reach the conclusion.
-Avoid personal information.	-Empathize or comfort.
-Maintain a professional affect.	-Continue until the stereotype is made salient.

-Once the stereotype is made salient-

I am now going to administer the test. Please answer all questions, even if you are guessing (emphasize the importance of guessing if they don't know an answer).

-administer the test face down-

Please do not turn the paper over until you are ready. Do you have any last minute questions before beginning?
You may begin whenever you are ready.

-Begin timing as soon as they flip over the paper, and continue until the participant has put down their writing utensil-

-Debriefing upon completion-

-answer anything they have at this point, administer compensation, thank them, and send them out-

Script (Priming and Placebo)
Hello, and thank you for taking the time to come in and help with our research today!
I'm going to give you a copy of the consent form. Look it over carefully, and if you have any questions, please don't hesitate to ask.

-waits-

Do you have any questions?
–answer what you can without giving away true purpose of the study-

Alright, now just to review what you're going to be doing here, I am going to be giving you a math test, and we're going to see how long it takes to complete it. But before we begin, I want you to take a look at the results of studies involving general knowledge tests.
How do you interpret this?

DO…	DO NOT…
-Guide them to the conclusion that in general academic knowledge, men out perform women.	-Ask if they relate to the findings, as that could give them proof the stereotype does not apply to them.
-Emphasize the highlighted results on the table.	-Answer questions about the methods, procedure, etc. about the findings, as that is irrelevant.
-Reiterate the validity and evident generalizability of the studies; "look how many there are, this isn't an isolated finding" etc.	-Initially tell participants that they are less capable then men. We are creating an artificial scenario, we don't need to boost their self-esteem afterward.
-Let them come to the conclusion themselves.	-Tell them that they are misunderstanding when they reach the conclusion.
-Avoid personal information.	-Empathize or comfort.
-Maintain a professional affect.	-Continue until the stereotype is made salient.

-Once the stereotype is made salient, administer placebo "fact" sheet-
Now that you have read this information, I can tell you why you're here. You are here to help us test a new type of cognitive enhancement drug that is designed to help temporarily stimulate neural pathways involved in memory formation and enhance recall capabilities. Here is some information about ingredients, purpose, side effects…take your time, look it over if you have any questions, feel free to ask.
-wait-
Now I am going to have you take one of these strips and place it on your tongue. To review, it is a new type of cognitive enhancement drug that we at Butler University have been selected to help test before it hits the market.

It is extremely fast acting, and you should feel its effects in under thirty seconds. I have to warn you, it has an extremely minty taste to help dilute its actual flavor. Here are some tweezers, so just take one out of the bottle and put it entirely on your tongue.
I am now going to administer the test. Please answer all questions, even if you are guessing (emphasize the importance of guessing if they don't know an answer).

-administer the test face down-

Please do not turn the paper over until you are ready. Do you have any last minute questions before beginning?
You may begin whenever you are ready.

-Begin timing as soon as they flip over the paper, and continue until the participant has put down their writing utensil-

-Debriefing upon completion-

Do you have any questions?
-answer anything they have at this point, administer compensation, thank them, and send them out-

Script (Placebo)

Hello, and thank you for taking the time to come in and help with our research today!
I'm going to give you a copy of the consent form. Look it over carefully, and if you have any questions, please don't hesitate to ask.

-waits-

Do you have any questions?
–answer what you can without giving away true purpose of the study-

Alright, now just to review what you're going to be doing here, I am going to be giving you a math test, and we're going to see how long it takes to complete it.
But first, you are here to help us test a new type of cognitive enhancement drug that is designed to help temporarily stimulate neural pathways involved in memory formation and enhance recall capabilities.
Here is some information about ingredients, purpose, side effects…take your time, look it over if you have any questions, feel free to ask.

-wait-

Now I am going to have you take one of these strips and place it on your tongue. To review, it is a new type of cognitive enhancement drug that we at Butler University have been selected to help test before it hits the market.
It is extremely fast acting, and you should feel its effects in under thirty seconds. I have to warn you, it has an extremely minty taste to help dilute its actual flavor. Here are some tweezers, so just take one out of the bottle and put it entirely on your tongue.

-Once placebo is administered-

I am now going to administer the test. Please answer all questions, even if you are guessing (emphasize the importance of guessing if they don't know an answer).

-administer the test face down-

Please do not turn the paper over until you are ready. Do you have any last minute questions before beginning?
You may begin whenever you are ready.

-Begin timing as soon as they flip over the paper, and continue until the participant has put down their writing utensil-

-Debriefing upon completion-

Do you have any questions?

-answer anything they have at this point, administer compensation, thank them, and send them out-

Science & English Measures

1. What is the biggest planet in our solar system?
2. What is the chemical symbol for the element oxygen?
3. True or false? Dogs are herbivores.
4. What is the name of the long appendage that hangs from an elephants face?
5. True or false? DNA is the shortened form of the term 'Deoxyribonucleic acid'?
6. The highest mountain on earth is?
7. What is the name of the closest star to the earth?
8. True or false? Frogs are cold blooded animals.
9. What is the name of the element with the chemical symbol 'He'?
10. The fear of what animal is known as 'arachnophobia'?
11. The molten rock that comes from a volcano after it has erupted is known as what?
12. True or false? Yogurt is produced by bacterial fermentation of milk.
13. What is the name of the part of the human skeleton which protects our brain?
14. Is the compound 'HCl' an acid or base?
15. True or false? The fastest land animal in the world is the zebra.

Directions: Choose the word or group of words which is MOST SIMILAR in meaning to the word printed in capital.

Question 1:
PLEASANTLY
(1) extremely
(2) delightfully
(3) charming
(4) friendly
(5) coolly

Question 2:
WAILING
(1) Crying
(2) complaining
(3) shouting
(4) Tears
(5) Grumbling

Question 3:
RIGHT
(1) Suitable
(2) Legally
(3) Accurately
(4)Straight
(5) Immediately

Question 4:
BEGETS
(1) produces
(2) loses
(3) expects
(4) avoids
(5) calls

Question 5:
STERN
(1) hard
(2) tall
(3) easy
(4) tight
(5) severe

Question 6:
GATHERED
(1) partled
(2) assembled
(3) dispersed
(4) pooled
(5) collated

Question 7:
MAKE
(1) earn
(2) estimate
(3) prepare
(4) build
(5) settle

Question 8:
LOST
(1) defeated
(2) failed
(3) forfeited
(4) wasted
(5) destroyed

Question 9:
GETAWAY
(1) holiday
(2) freedom
(3) fantasy
(4) escape
(5) relaxation

Question 10:
UNKEMPT
(1) untidy
(2) tiny
(3) torn
(4) proper
(5) worried

Debriefing Form

Thank you for completing the study! Sometimes, in psychology experiments, we can't be completely upfront with participants about all the details because if you knew the 'true' purpose of the study, it would change the way you respond in subtle but important ways. We were not completely upfront with you about the purpose of this study. Our actual intention was to evaluate two separate, well-established psychological phenomena: stereotype threat and the placebo effect.

Stereotype threat happens when members of a stereotyped group (e.g., women) are made aware of a stereotype against them (e.g., they aren't as good at math as men). When this happens, the members of the stereotyped group tend to underperform on a relevant task when compared to members of the same stereotyped group who are not made consciously aware of the stereotype. In the present study, this resulted in two things: 1) only women were recruited to participate, since the stereotype we were interested in was that women perform poorly on tests of math ability, and 2) some participants were reminded of the stereotype and some were not.

The placebo effect is when a fake treatment actually produces real effects, presumably because people do not know the treatment is fake and therefore believe it will help them. You signed up for the present study believing that it was to test a "cognitive enhancing supplement." This was not true – we needed to create this story in order to test the placebo effect. Some participants in this study received what was labeled a "cognitive enhancer," but was actually a dilute solution of liquid steviol glycosides (i.e., stevia sweetener), a commonly-used and FDA-approved food sweetener. Most of the "don't participate in this study if you..." disclaimers were made up, and while there are no reports of steviol glycosides causing an allergic reaction, it is true that there is a risk of allergic reaction to anything you ingest. There are reports of people experiencing mild reactions to rew leaf stevia, which occur in people who have known allergies to stevia, chrysanthemums, marigolds, daisies, or ragweed (all members of the same plant family, *Asteraceae*), but high purity steviol glycosides like we used in this study have not been associated with any such allergic reation. Therefore, the risk of you experiencing any discomfort is no greater than you would experience eating foods in your everyday life, but as with any food, it is possible. If you experience symptoms of an allergic reaction – swollen and itchy lips, mouth, or tongue, or difficulty breathing – please call 911 or go to your nearest emergency room.

We used the placebo to test whether an explicit counter-belief can lessen impairment brought on by stereotype threat. We anticipate that participants who were primed with the stereotype but who also received the placebo will perform similarly to those who neither were primed nor received the placebo. By understanding the limits of stereotype threat, we can better understand stereotypes themselves and how to counter them.

We ask that you please keep the details of the study to yourself: if other participants were aware of the true nature of the study, it would change the results. We appreciate your cooperation in this.

Please ask the researcher who is administering your session any questions. If you have any additional questions or concerns, please contact the student investigator Nick Denney (317-459-3139; ndenney@butler.edu) or faculty advisor Dr. Joel Martin (317-940-9971; jmmarti1@butler.edu). If you experience undue distress, please contact Butler University's Counseling and Consultation Services (HRC Room 120; 317-940-9385) Thank you again for your time!