2024

Attitude Formation & Persuasion Via Reactance: No, You Can't – Yes, I Can!

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Presented to the Graduate Faculty of Claremont Graduate University in partial fulfillment of the requirements for the degree of Master of Arts in Psychology.

We certify that we have read this document and approve it as adequate in scope and quality for the degree of Master of Arts in Psychology.

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2024

Abstract

This study was designed to fill a significant gap in how psychological reactance theory (PRT; Brehm, 1966) is traditionally used in social psychological experiments. This study attempted to show that PRT can be used as a method to induce positive attitude formation. There is a need to understand how motivation to restore freedom (the driving force behind PRT) can be harnessed as a tool to persuade in a manner incongruent to typical persuasion techniques and form evaluations of attitude objects, and how the affective component of PRT can be used as a form of evaluative conditioning. The study consisted of 144 participants collected from MTurk. Both repeated measures ANOVA and double sequential mediation analyses were employed to investigate hypotheses; the results suggested that the attempt to induce reactance was unsuccessful. Both repeated measures ANOVA and double sequential mediation analyses were employed to investigate hypotheses. While the ANOVA did not yield significant results in terms of attitude change, thus failing to support Hypothesis 1, the double sequential mediation analysis revealed a direct impact of the experimental manipulation on increasing the intention to obtain nootropic supplements ($b = 2.335$, $SE = .515$, $t = 4.533$, $p < .0001$), supporting Hypothesis 2. However, the indirect effects through message evaluation or Psychological Reactance Theory (PRT) scale scores were not significant and failed to support Hypothesis 3.

Keywords: Persuasion, Mediation, Reactance, PRT, Attitudes, Attitude Formation

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The principles of psychological reactance theory (PRT) were first introduced by Brehm in 1966, marking a significant milestone in understanding human behavioral responses to perceived constraints on freedom. Central to PRT is the concept of "reactance," a psychological response that arises when an individual perceives their freedom of choice as being limited or threatened, leading to a motivational drive to regain that lost freedom. This concept was derived from Brehm's (1956) earlier observations, where he noted that when participants had to choose between two items as a gift, the chosen item consistently became more attractive than the one not selected. The elimination of one alternative as a pre-decisional factor (over which the participant has freedom of control) apparently increased the desirability of the chosen gift (Brehm, 1956; Linder & Crane, 1970). Freedom of control is the primary motivational aspect that drives PRT (Rosenberg & Seigel, 2017).

As noted, reactance can increase motivation to engage in restoration of freedom and also enhance the attractiveness of an object (Brehm, 1956, 1966). Another important proposition of PRT is that reactance magnitude (i.e. how much reactance is elicited) depends on the characteristics of the threat or elimination of freedom(s) (Heilman, 1976). This implies that characteristics of how a threat was eliminated could have an impact on the magnitude of the threat elimination or elimination of freedom(s). It follows then that these same characteristics or factors also may increase attractiveness of an eliminated choice as the magnitude of reactance increases. Steindl et al. (2015) showed that the extent of arousal (due to reactance) was determined by the importance of the threatened freedom, the proportion of freedoms eliminated or threatened with elimination, and the magnitude of the threat. However, this may not always be

the case; the importance of the threatened freedom may not be as salient in circumstances where an attitude or evaluation has yet to be formed.

Expanding upon these foundations, studies have delved deeper into the varied mechanisms of PRT. Miron and Brehm (2006) further elaborated on the subjective experience of reactance, indicating that the emotional response to reduced freedoms can vary significantly among individuals and contexts. This variance is often attributed to personality differences, past experiences, and the perceived legitimacy of the threat to freedom. Furthermore, Miller et al. (2022) investigated the role of message framing in inducing reactance, suggesting that more aggressive or authoritative messages tended to elicit stronger reactance due to perceived patronization or coercion (Ratcliff et al., 2019).

In the digital age, research extended into the realm of online behaviors. Riedel and colleagues (2023) explored how online advertisements and restrictions can induce reactance, leading to adverse outcomes for brands and organizations. This adaptability of PRT to various contexts underscores its robustness and relevance in contemporary psychological research. Likewise, reactance is not only a phenomenon observed in individual decision-making but also is manifest in group dynamics and societal movements. Recent sociopolitical movements offer empirical contexts for examining the dynamics of reactance within and between groups, particularly how perceived threats to freedoms from both in-groups and out-groups motivate collective action to reclaim those freedoms. Graupmann et al. (2011) delved into this phenomenon, exploring how reactance is not only a response to external out-group pressures; it also can be triggered by constraints imposed by one's own group, highlighting the complex interplay between individual and group identities in the face of freedom threats.

Reactance for Persuasion

The motivational drive to restore freedom or counter a perceived threat to freedom has been the basis of a wealth of research pertaining to resistance of persuasion (Rosenberg & Seigel, 2017). The majority of PRT research has focused on how to counter or resist persuasion (Tennen et al., 1981), and how to persuade without activating reactance (Xu, 2015). Reactance is a powerful motivating force that combines cognition and affect to propel a person to resist attempts to limit their freedom (Dillard & Shen, 2005; Van Petegem et al., 2015). However, the current study was designed to explore in detail how reactance can be used for persuasive purposes by stimulating attraction to the eliminated choice via motivation to restore freedom and form a positive evaluation of a previously neutral attitude object.

Growing from this possibility, the nuanced relationship between reactance and persuasion offers a wealth of opportunities for exploring innovative persuasive strategies. For instance, techniques that affirm autonomy and subtly lead individuals towards making a choice can effectively mitigate reactance while still guiding decision-making processes (Miller et al., 2007). Similarly, research by Yan et al. (2010) point out that message framing that acknowledges and validates the individual's freedom to choose or reject the message can reduce reactance and improve persuasion effectiveness.

In addition to these studies the dynamics of reactance have been explored in various contexts ranging from health communication to marketing and political campaigns. For instance, Grandpre et al. (2003) and Slavin (2019) demonstrated that anti-drug messages that were perceived as overly controlling increased drug-related attitudes and intentions, showcasing a counterintuitive effect of reactance in persuasion. Conversely, when messages were tailored to

resonate with the individual's values and self-concept, reactance may be reduced, and the persuasive message may be more effective (Silvia, 2005).

This body of work underscores the importance of a deeper understanding of reactance in the development of persuasive communications. The current study endeavored to contribute to this understanding by exploring how reactance, typically seen as a barrier to persuasion, can be strategically activated and directed to enhance the attractiveness of a choice, thereby facilitating persuasion in a manner that aligns with the individual's sense of autonomy and freedom.

Attitude Formation

Affect can be the basis for evaluative cognition that leads to attitude formation (Olson & Fazio, 2001). The method by which this is achieved is called evaluative conditioning, and it is typically exemplified by the pairing of an evaluative stimulus with a neutral stimulus which, when associated with the evaluative stimulus, becomes associated with the neutral stimulus such that the neutral stimulus becomes conditioned by this association (Olson, 2002) conditioning, often used in advertisements, works similarly with an induced or primed affect that is paired with the neutral stimulus to produce through association a conditioned stimulus (Groenland & Schoormans, 1994). The current study investigates whether this process of evaluative conditioning based on affect, works with other pairings.

The concept of attitude formation through affective means extends farther into the realms of associative learning and cognitive psychology. De Houwer (2007) elaborated on the process of evaluative conditioning, noting its potential variability and complexities based on different conditioning paradigms and individual differences. This understanding enhances the methodological consideration for research in attitude formation and its implications for advertising, persuasion, and social cognition. Further, research by Gawronski and Bodenhausen

(2006) integrated the principles of evaluative conditioning with a broader model of associative and propositional processes. They argued that attitudes formed by evaluative conditioning may not solely rely on simple associative mechanisms, but also may involve more complex propositional thinking, such as belief formation about the associations.

In the realm of advertising, where affective conditioning is frequently applied, Pham (1998) emphasized the role of emotion as a mediator in advertising effectiveness. The emotional responses elicited by an ad can significantly impact the consumer's attitude toward the product, especially when those emotions are congruent with the ad's content and the product's positioning.

The persistence and resistance of attitudes formed through affective means have been a subject of interest. Rydell and McConnell (2006) suggested that attitudes formed through direct experience or affective conditioning tend to be more resistant to change and have greater predictive validity regarding behavior than attitudes formed through indirect means.

The Current Research

The purpose of this study is to show that a motivational drive paired with a neutral attitude object can condition a person to associate the two, around which an attitude will form. This specific method of pairing a motivational drive (in this case PRT) has not been explored in the research literature (Miron & Brehm, 2006; Rosenberg & Seigel, 2017; Steindl et al., 2015). The present study was designed to determine if motivational conditioning is possible using a drive to restore freedom(s) in line with the principles of PRT. This was expected to induce an approach motivation (Mühlberger et al., 2020) aimed at the neutral attitude object (via inducement of reactance through the elimination of freedom) to obtain the attitude object. Furthermore, it was predicted that the reactance would bolster desirability of the attitude object and precipitate attitude formation. Another important consideration fostered by this study is that

PRT may be used as an approach motivated drive to persuade or appeal to individuals who have no prior attitude about a neutral attitude object. The drive behind PRT should be possible to use when trying to propel a person toward a particular attitude object without the person being aware that this is the experimenter's goal. This is a technique that has been used often in sales to drive up the price of an object by claiming it is not available for sale or already on hold for another buyer.

Extending this concept, the study also explores the differential effects of various forms of reactance (i.e., anger, negative affect, and behavioral intention) on the attitude formation process. It was critical to understand not only if reactance could induce attitude formation but also how the qualitative aspects of induced reactance may affect the strength, direction, or durability of the resulting attitude (Brehm & Brehm, 1981; Rains, 2013).

In addition to the psychological mechanisms at play, the practical implications of utilizing PRT in various contexts such as marketing, political campaigns, or health interventions were considered. By trying to understand the optimal conditions under which PRT can be effectively used to influence attitudes, practitioners can design better interventions and communications that respect individual autonomy while still achieving desired outcomes (Quick & Considine, 2008).

Ambivalence and Persuasion

The incorporation of ambivalence into the framework of persuasion was done to shed light on the intricate dynamics of attitude formation and resistance. In the complex landscape of persuasion, ambivalence emerges as a fundamental concept, offering insights into the complexities of attitude formation and resistance. Ambivalence, characterized by the simultaneous experience of conflicting emotions, attitudes, or beliefs towards a particular

stimulus, plays a crucial role in shaping individuals' responses to persuasive messages. Within the framework of psychological reactance theory, the notion of ambivalence gains relevance. As individuals encounter persuasive attempts that challenge their existing beliefs or attitudes, they may experience ambivalence, grappling with conflicting desires to maintain autonomy while also considering the merits of the presented arguments (van Harreveld et al., 2009). This internal conflict fuels the motivational drive to restore freedom, a central tenet of PRT, as individuals seek to reconcile the perceived threat to their autonomy with the induction of reactance.

Ambivalence also can serve as a catalyst for deeper processing of persuasive messages. When individuals confront conflicting information, they engage in cognitive elaboration, scrutinizing the arguments presented and evaluating their internal stance towards the message (Bohner & Dickel, 2011). This heightened level of scrutiny enhances receptivity to persuasive appeals, as individuals strive to resolve the internal tension and achieve cognitive consistency (Priester & Petty, 1996).

In the context of the present study, which is designed to explore the interplay between PRT and attitude formation, understanding ambivalence provides valuable insights into the mechanisms underlying persuasion. Although not included in the hypotheses below, acknowledging the potential presence of ambivalence among participants, the study seeks to unravel how conflicting motivations to restore freedom may interact with the formation of attitudes towards a neutral object. This nuanced perspective not only enriches our understanding of persuasion processes but also may offer practical implications for designing persuasive communications that resonate with individuals' complex cognitive and emotional landscapes.

Hypotheses

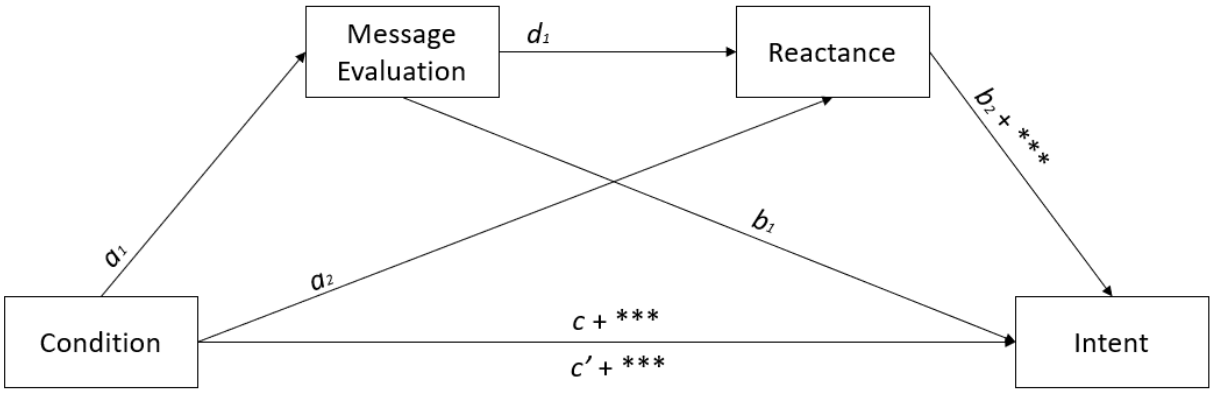
It is expected that this study will add to the growing body of research on PRT and expand it into a rarely explored arena. Specifically, it addresses the possibility of an inherent increase in desirability resulting from a motivational drive to restore freedom when paired in tandem with a neutral attitude object. Research regarding PRT has been limited in scope in that it has been studied primarily as a feature motivating resistance to persuasion or as a defense to be circumvented when persuasion is used. By inverting the traditional concept of how PRT is commonly studied, the present study is designed to show how attitude formation also can be achieved via evaluative or motivational conditioning. Consequently, three hypotheses were tested.

Hypothesis 1: Positive attitude formation will occur after having paired a neutral attitude object (Nootropics) with the motivational drive to restore freedom (PRT). This will be evidenced by a positive change from the attitude measured at time 1 to attitudes measured at time 2.

Hypothesis 2: The elimination of freedom that incites reactance will increase intent to obtain the previously neutral attitude object.

Hypothesis 3: Evaluation of the descriptive Nootropics message will mediate the experimental effect, such that negative message evaluation will reduce the effect of the reactance induction on attitudes toward Nootropics (a double sequential mediation effect). See Figure 1 for a diagrammatic presentation of the theoretical model.

Figure 1 Theoretical Model



Methodology

Participants

The participants in this study were required to be over 18 years of age, United States citizens, and speak / read English. They were obtained from Amazon's Mechanical Turk (MTurk). An a priori power analysis was conducted using G*Power version 3.1.9.7 (Faul et al., 2007) to determine the minimum sample size required to test the study hypotheses. Results indicated that a minimum of 36 participants per group were required to detect a small effect size at a significance criterion of $\alpha = .05$, power (1-β err prob) = 0.95, using a repeated measures (within / between subjects) analysis of variance (ANOVA). MacKinnon et al., (2002) suggested to detect a medium effect for a mediation analysis required a sample size of more than 100 participants. The number of participants suggested by MacKinnon and colleagues was combined with the sample size suggested by GPower and padded by 15 to 20 percent in the case of incomplete survey responses.

The resulting total of 155 participants was obtained after data cleaning and screening. Those who had prior knowledge of the attitude object "Nootropics" were removed from the analysis to ensure that the attitude towards it was not formed prior to this study. Each participant was compensated $0.50 for their participation. The study's participants spanned various age groups: 16.1% (n = 25) were between 18 and 28 years, 32.9% (n = 51) fell within the 29-39 age range, 27.7% (n = 43) were aged 40-50, and 23.2% (n = 36) were over the age of 50. With respect to ethnicity, the majority of the participants identified as White (Non-Hispanic)/European American (75.5%, n = 117), followed by Black or African American (9.0%, n = 14), Hispanic/Latino (6.5%, n = 10), Asian/Pacific Islander/Asian American (5.8%, n = 9), with fewer participants identifying as Native American/Alaskan Native/Indigenous (0.6%, n = 1), or Other (2.6%, n = 4). In terms of gender identity, 67.7% (n = 105) of the participants identified as female, 29.7% (n = 46) as male, and 2.6% (n = 4) as non-binary or other.

Study Design

This experimental study employed a between-subjects design to examine the effects of psychological reactance on attitude formation towards Nootropics, an attitude object with which participants had previously not formed attitudes. Participants were randomly assigned to one of two groups: the experimental group, where reactance was induced, and the control group, which did not experience the induction of reactance.

The primary manipulation involved presenting both groups with identical non-persuasive, informational content about Nootropics. Following the message presented, a scenario designed to induce reactance was given only to the experimental group. This scenario informed participants that they could no longer participate in a hypothetical paid study about Nootropics after initially indicating interest, aiming to restrict their perceived freedom and trigger reactance.

To ensure the formation of attitudes from a neutral baseline, a screening question was included at the end of the survey: "Prior to this survey, did you know what a Nootropic supplement was?" Responses to this question allowed for the exclusion of participants with pre-existing knowledge or attitudes toward Nootropics from the analyses. Only those who indicated no prior knowledge were included in the hypothesis testing to assess the impact of reactance induction on attitude formation. Another question was placed in the inducement of reactance portion of the survey, which asked if participants were willing to participate in a paid study. This question was also used to further screen the sample so that those who were not interested in participating, and thus not susceptible to the inducement of reactance could be removed from the analysis.

Data were collected at two time points using semantic differential scales: before and after the manipulation. The study utilized repeated measures ANOVA to analyze the change in attitudes towards Nootropics from pre-manipulation to post-manipulation. Also, a double sequential mediation analysis was conducted to explore the role of message evaluation and reactance in influencing the intention to use Nootropics. This design allowed for the assessment of the direct and mediated effects of reactance on the formation of new attitudes and behavioral intentions.

Procedure

All participants were required to complete a Qualtrics survey. The survey included minor deception, participant screening, various measures, and a manipulation of reactance. The study was pre-registered on Open Science Framework (https://osf.io/zfd5c/?view_only=a08450b5b9e242a090f7332dc02ae499).

The participants were first asked to read and accept or decline the informed consent statement. If they declined, they were thanked for their consideration and the survey was terminated. Those who accepted the informed consent disclosure completed a demographic and personal health questionnaire about their vitamin supplement usage. Demographic information such as age, gender, and race/ethnicity were collected. The questions about the participant's vitamin supplement usage were asked to give a plausible reason for the experimental group's participants to be asked to participate in a paid medical study (that was the basis upon which the reactance was induced). See Appendix A for a complete list of questions regarding demographics and vitamin use.

Participants were then given a semantic differential (Osgood et al., 1957) pertaining to Nootropics, the attitude object. Upon completion of the semantic differential measure the participants were randomly assigned to the reactant (experimental group) or non-reactant (control group) condition. In both conditions the participants were given the same informative, non-persuasive message about Nootropics (see Appendix C). This message contained information pertaining to the specific Nootropic supplements (Unifiram, and Sunifiram), the listed uses for Nootropics in the medical field per Brody and Brennan MD (2022), and a short list of studies about Nootropics (Romanelli et al., 2006; Temerdashev et al., 2021). The information in the message was non-evaluative, stating the possible use of these substances without a strong persuasive case made for their use.

Participants were then given another semantic differential to evaluate the strength of the message presented. Directly following the message evaluation, participants were asked if they would like to check their eligibility to participate in a paid medical study that would be evaluating a Nootropic that the FDA is considering approving for general over the counter

(OTC) consumption. Upon clicking either “yes” or “no” to the eligibility check, those participants who clicked “yes” were then informed that “Unfortunately, the researchers are no longer accepting new participants in the study. Please write a brief sentence as to why you wished to participate in the text box below” (see Appendix E). In the open text box, the participants were able to write their reasons for having interest in this Nootropic supplement.

The inducement of reactance was then measured with a modified version of the reactance scale used by Dillard and Shen (2005), (see Appendix F). Participants in the control group were not exposed to any reactance-inducing manipulation. They received the same information about Nootropics without a subsequent exclusion from a paid study. Control subjects received the same reactance scale as the experimental group.

Following the reactance scale participants were required to fill out another semantic differential about Nootropics to gauge the differences or change in attitude pre (time 1) and post (time 2) message and inducement of reactance. Although unexposed to the reactance manipulation, the control group was asked to complete the state reactance and semantic differential; this was done to determine that they did not perceive any reactance in comparison to the experimental group and to ascertain any differences between the answers of the semantic differential between experimental and control groups.

Participants were then instructed to complete the intent scale to determine their interest in using or purchasing Nootropics online or over the counter. The intent scale variable was designed to understand the behavioral aspect of participants' likelihood of acting on their attitudes and perceptions about the Nootropic Supplement, it stands as another pivotal outcome variable in the study. Determining intent was crucial to this study, as it bridges the gap between

mere attitudes and actual behavior; it provided insights into potential market behavior and the likelihood of the product's adoption by the public were it to be made available.

Screening questions were asked last, to determine that participants had no knowledge of the attitude object designated in this study, namely Nootropics, Cognitive Supplements, or Smart Drugs. Those participants who answered “yes” to having knowledge of or about Nootropics were excluded from the data analysis as this study was focused on the formation of positive attitudes from previously neutral or unformed attitudes. Those participants who reported that they did not know anything about what Nootropics are were retained for analysis (see Appendix I).

At the end of the Qualtrics survey, participants were fully debriefed about the purpose of this study. Included in the debrief, they were informed that they will receive their full compensation for this study for having participated and completed it. The secret key generated for each participant to claim their compensation was given in the body of the debrief block.

Measured Variables

Pre-attitude evaluation. This 7-item semantic differential (McCrosky et al., 1967) was used to measure participants’ attitudes prior to the message (time 1) and inducement of reactance (for the experimental group), and it consisted of a range of bipolar adjectives directly related to the Nootropic supplements (e.g., Effective/ Ineffective, Safe/ Dangerous). Participants rated the items on 7-point response scales, with 1 indicating the most positive response and 7 indicating the most negative response. In the present study, internal consistency was $\alpha = .89$ (see Appendix B).

Message evaluation. This 6-item semantic differential, consisting of a range of bipolar opposites (e.g., Believable/ Unbelievable, Neutral/ Biased), was used to serve as the initial mediator of the effect of the intervention on attitudes and intentions regarding Nootropics.

Participants rated the items on 7-point response scales, with 1 indicating the most positive response and 7 indicating the most negative response. In the present study, internal consistency was $\alpha = .89$ (see Appendix D).

Reactance scale. This measure contained two sets of questions to measure reactance inducement (threat to freedom) and emotional state, which were summed to create a composite score for each participant. First, five questions measured reactance inducement (e.g., "I feel that my freedom to make choices was limited recently.") on 7-point Likert response scales, with 1 indicating "Strongly Agree" and 7 indicating "Strongly Disagree." Second, to measure emotional state, four words ("Irritated," "Angry," "Annoyed," and "Aggravated") were rated on 4-point response scales; this scale been validated in previous studies (Dillard & Peck, 2000; Dillard & Shen, 2005; Rains & Turner, 2007; Quick & Stephenson, 2007). The composite scale consisted of both the reactance inducement and emotional state, consisting of 9-items total, and had an internal consistency of $\alpha = .60$ combined, an $\alpha = .81$ for the reactance inducement items, and an $\alpha = .91$ for the emotional state items (see Appendix F).

Post-attitude scale. Like the pre-attitude scale, this 7-item semantic differential consisted of a range of bipolar adjectives directly related to the Nootropic supplements (e.g., Useful/ Useless, Secure/ Risky). Participants rated each item on 7-point response scales, with 1 indicating the most positive response and 7 indicating the most negative response. In the present study, internal consistency was $\alpha = .84$ (see Appendix G).

Intent scale. To capture participants' intent, two questions were asked about participants' willingness to engage with the product (e.g., "Would you consider purchasing a Nootropic Supplement online?"). Responses were measured on a 7-point Likert-type response scale, with 1 indicating "Very likely" (indicating interest) and 7 indicating "Not at all likely" (indicating lack

of interest). This was later recoded for ease of interpretation so that higher scores equaled higher intention to obtain a Nootropic supplement. In the present study, the items' correlation coefficient was .68, $p < 0.001$ (see Appendix H).

Ambivalence Measure. To assess participants' ambivalence toward nootropic supplements, we utilized semantic differential scales both before (Time 1) and after (Time 2) the experimental manipulation. These scales were designed to capture a spectrum of attitudes toward the potential outcomes associated with nootropic supplement use. The semantic differentials included polar adjectives relevant to nootropic supplements, such as "Effective/Ineffective," "Safe/Dangerous," "Reliable/Unreliable," and "Natural/Synthetic" among others, reflecting both potential positive outcomes and concerns. Following the approach described by Hohman et al. (2014), for each participant, the standard deviation across all items on the bipolar semantic differential scales were computed. This statistical measure served as our operational definition of ambivalence, with a higher standard deviation indicating greater ambivalence (Hohman et al., 2016). This approach assumes that a wider spread of scores across the semantic differential scale capturing a mix of positive and negative beliefs about Nootropic supplement use reflects a state of ambivalence towards these supplements.

Results

Data Cleaning

A total of 255 participants were recruited. Data were excluded for the following reasons (Ruybal & Seigel, 2021): having prior knowledge of Nootropic Supplements (n = 36), failing to spend longer than 10 seconds on reading the message (indicating lack of appropriate attention to the message) (n = 35), dropping out mid-survey (n = 26), and participants who selected not to participate in the paid study that was presented in the survey as pretext for the inducement of

reactance (n = 29) were removed. Retaining the outliers in this dataset was deemed crucial for preserving the integrity and holistic understanding of the data, as these anomalies may represent valuable insights, critical variations, or real-world phenomena that are essential for comprehensive analysis and accurate modeling. A final sample size of 129 was used for the analyses.

Assumptions

After ensuring the quality and integrity of the dataset through meticulous data cleaning, the next step was to evaluate rigorously the statistical assumptions critical for the validity of the Repeated Measures ANOVA and Double Sequential Mediation analysis.

For the repeated measures ANOVA, the assumption of sphericity was not applicable because sphericity concerns the variances of the differences between all combinations of levels, and with only two levels, there is just one variance to consider. The Shapiro-Wilk test indicated that the data significantly deviated from normality for attitudes at time 1, $W = .958$, $p < .001$; message evaluation, $W = .972$, $p = .004$; and attitude at time 2, $W = .979$, $p = .023$. The distribution of scores for the reactance scale did not significantly deviate from normality, $W = .987$, $p = .190$.

The assumption of normality was also violated for intent, $W = .965$, $p < .001$. The skewness and kurtosis values were examined for each variable to assess the symmetry and distribution of tails, respectively. For attitude at time 1, the skewness was .168 ($SE = .202$), indicating an approximately symmetric distribution, and the kurtosis was .997 ($SE = .401$), suggesting a normal-tailed distribution.

The message evaluation scale showed a moderate positive skewness of .606 ($SE = .202$) and kurtosis of 1.361 ($SE = .401$), indicating a slightly leptokurtic (slim peaked) distribution. The

PRT scale displayed a skewness of -.020 (*SE* = .202), which is very close to perfect symmetry, and a kurtosis of -.290 (*SE* = .401), indicating a platykurtic (broad or flat) distribution. Attitude at time 2 had a skewness of .128 (*SE* = .202), suggesting a roughly symmetric distribution, and a kurtosis of 1.153 (*SE* = .401), which is indicative of a leptokurtic distribution. Finally, intent had a skewness of .000 (*SE* = .202), showing perfect symmetry, and a kurtosis of -.984 (*SE* = .401), suggesting a platykurtic distribution. All skewness and kurtosis values fell within the acceptable range for assuming a normal distribution for the purposes of parametric statistical analysis. Box's test of equality of covariance matrices was not significant, indicating that the assumption of equal covariances was not violated, Box's $M = .655$, $F(3, 6048377.689) = .215$, $p = .886$.

For the mediation analysis, a regression analysis was conducted to obtain collinearity diagnostics; it indicated that multicollinearity was not a concern. The Variance Inflation Factor (VIF) for the variable Condition (experimental / control) was 1.021, for the message evaluation scale was 1.033, and for the PRT scale was 1.014. All VIF values were well below the commonly used threshold of 10, suggesting that multicollinearity did not unduly influence the regression estimates. The residuals were examined for normality and homoscedasticity and met the necessary assumptions for linear regression.

Repeated Measures ANOVA

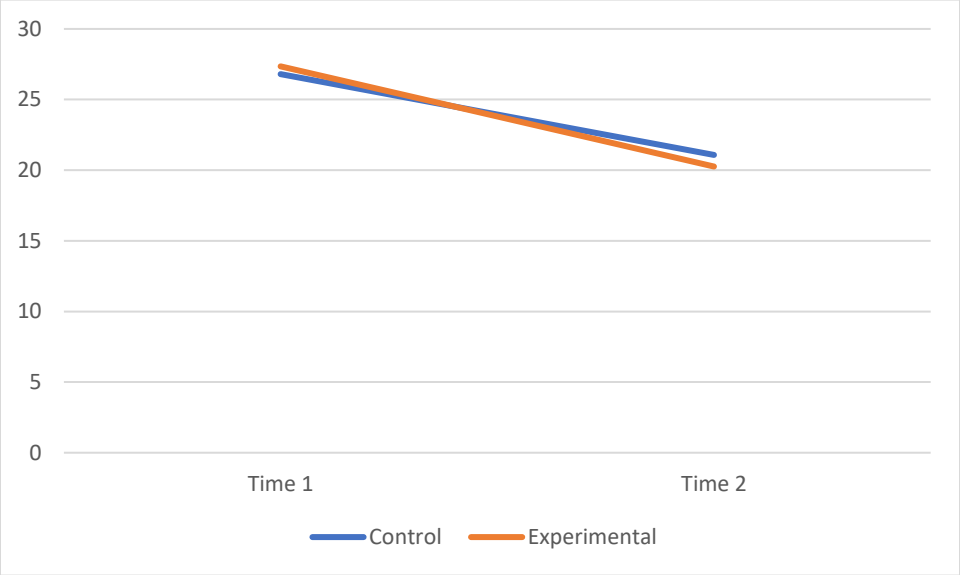
This repeated measures ANOVA was conducted to test Hypothesis 1, which posited that a positive change in attitudes towards Nootropics would occur when paired with the motivational drive to restore freedom, as predicted by Psychological Reactance Theory. This repeated measures ANOVA was conducted on only those participants who had no prior knowledge of the attitude object “Nootropics” to ensure that the attitude towards it was not formed prior to this study, as well as those who chose to participate in the “paid study” that was pretext for the

inducement of reactance $N = 129$. The purpose of this ANOVA was to evaluate the impact of induced reactance on z-score transformed attitudes towards Nootropic supplements at two time points: before (pre-attitude semantic differential) and after (post-attitude semantic differential) the message and inducement (experimental group only). The transformation into z-scores was done to control for test variation effects, insofar as different test formats were used for pre- and post-test attitude measures. Participants were randomly assigned to either a control group (n = 75) or an experimental group (n = 54) that received a reactance inducement. The removal of those with prior knowledge of Nootropics and those who did not want to participate in a paid study resulted in fewer participants in the experimental group. No post hoc tests were conducted due to the presence of fewer than three groups.

Owing to the standardization of pre- and post-test measures, the analysis did not reveal a significant main effect of time on attitudes, $F(1, 127) = .248$, $p = .619$, with a very small effect size, partial $\eta^2 = .002$. However, there was a significant interaction effect between time and condition, $F(1, 127) = 3.866$, $p = .051$, partial $\eta^2 = .030$, indicating a small but significant difference in the attitude changes between the control and experimental groups.

Descriptive statistics indicated that at Time 1, the control group had a slightly lower mean z-score for attitudes ($M = -.119$, $SD = .964$) compared to the experimental group ($M = -.043$, $SD = 1.000$). At Time 2, the control group had a mean attitude z-score that was slightly higher ($M = -.022$, $SD = .947$) while the experimental group's mean decreased ($M = -.208$, $SD = 1.013$). These trends align with the significant time-by-condition interaction effect.

Figure 2. Pre- and Post-Message Attitudes



Note: For clarity, the scores used in the line graph above were not transformed z scores of the intent scale but actual scores.

The test for equality of covariance matrices showed no significant differences across groups, Box's M = .803, $F(3, 1121268.230) = .263$, p = .852. Levene's test for equality of error variances was not significant for both times, indicating homogeneity of variances for time 1, $F(1, 127) = .029$, p = .866, and for time 2, $F(1, 127) = .123$, p = .726.

The test of between-subjects effects showed that the condition did not have a significant effect on the average transformed attitudes, $F(1, 127) = .116$, p = .734, partial η^2 = .001.

The analysis revealed a significant interaction effect between time and condition (p = .051), indicating a small but statistically significant change in attitudes due to reactance induction. Specifically, the experimental group demonstrated a greater decrease in attitude scores, contrary to Hypothesis 1, which anticipated a positive attitude change. Therefore, Hypothesis 1 was not supported as the attitude change was in the negative direction.

Sequential Mediation Analysis

A double sequential mediation analysis was employed to examine Hypothesis 3, predicting that the evaluation of the descriptive Nootropics message and the subsequent reactance would mediate the relationship between experimental conditions and the intention to obtain Nootropics. The analysis used PROCESS Version 4.2 (Hayes, 2022, Model 6) to examine the role of message evaluation and reactance as mediators in the relationship between experimental conditions (control vs. experimental) and the intention to obtain nootropic supplements. This analysis was also conducted on only those who had no prior knowledge of the attitude object "Nootropics," as well as only those who chose to participate in the "paid study" that was pretext for the inducement of reactance.

For the message evaluation mediator (M1), the model explained 1.33% of the variance in message evaluation scores, $R^2 = .013$, $F(1, 127) = 1.7163$, $p = .193$. The experimental condition was not a significant predictor of message evaluation ($b = 1.378$, $SE = 1.052$, $t = 1.310$, $p = .193$). Regarding the PRT scale (M2), the model accounted for 2.38% of the variance, $R^2 = .024$, $F(2, 126) = 1.539$, $p = .219$. The predictors, including the experimental condition ($b = .5655$, $SE = 1.114$, $t = .508$, $p = .613$) and message evaluation ($b = .150$, $SE = .093$, $t = 1.610$, $p = .110$), were not statistically significant.

The overall model for the outcome variable, intention to obtain Nootropic supplements, was significant and accounted for 22.8% of the variance, $R^2 = .228$, $F(3, 125) = 12.335$, $p < .0001$. Message evaluation was a significant negative predictor ($b = -.1902$, $SE = .0436$, $t = -4.366$, $p < .0001$), whereas the experimental condition did have a significant direct effect ($b =$

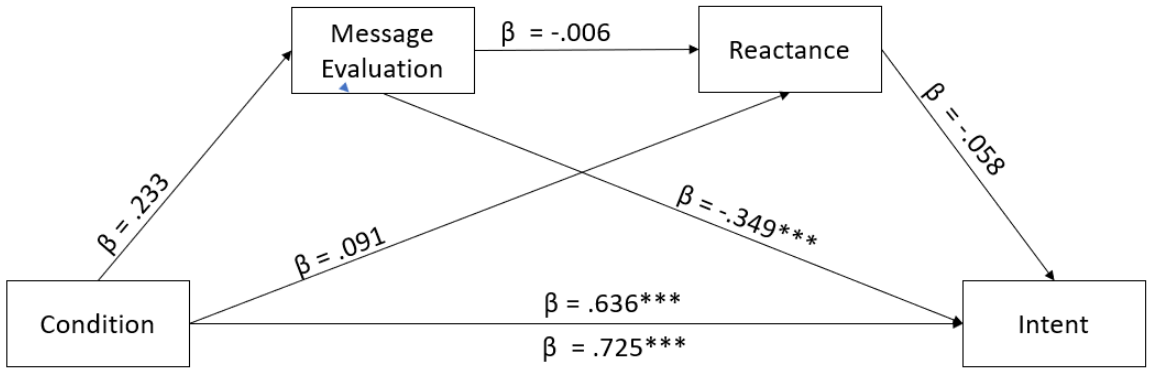
2.335, *SE* = .515, *t* = 4.533, *p* < .0001) but PRT scale scores did not (*b* = -.030, *SE* = .041, *t* = -.731, *p* = .466).

The total effect of the experimental condition on intention to obtain Nootropic supplements was significant (*b* = 2.049, *SE* = .548, *t* = 3.741, *p* = .0003). However, the total indirect effect was not significant (Effect = -.2853, *SE* = .228, LLCI = -.729, ULCI = .162). Specifically, the indirect effect through message evaluation alone was not significant (Effect = -.262, *SE* = .212, LLCI = -.697, ULCI = .139), as well as the indirect effects through PRT scale alone (Effect = -.017, *SE* = .065) and through the sequential mediation path (Effect = -.006, *SE* = .014) were not significant.

Analysis suggests the experimental manipulation had a direct impact on increasing the intention to obtain nootropic supplements, with participants in the experimental condition showing a significantly higher intent compared to the control group. However, there were no significant indirect effects through message evaluation or PRT scale scores, whether individually or in sequence. The contrast tests for specific indirect effects were also not significant. This indicates that while the experimental condition directly influenced intentions, the hypothesized mediation paths were not supported by the data.

The findings from the mediation analysis indicate that while the experimental condition directly influenced intentions, the hypothesized mediation paths involving message evaluation and Psychological Reactance Theory (PRT) scale scores were not supported. However, Hypothesis 2, which predicted an increase in intent to obtain Nootropics due to the elimination of freedom inciting reactance, was supported, as the experimental condition significantly increased intentions to obtain Nootropic supplements. Therefore, Hypothesis 3 was not confirmed by the results, but the direct effect observed supported Hypothesis 2.

Figure 3 Full Figure Diagram of Condition-Intent analysis with Message Evaluation and Reactance Mediators



Note: Path coefficients represent the strength and direction of the relationships between the experimental conditions (IV), mediators, message evaluation (M1), inducement of reactance (M2), and the dependent variable intent to obtain a Nootropic supplement (DV).

*$p < .05$, $p < .01$, $p < .001$ indicate levels of statistical significance *, **, *** respectively. All coefficients are standardized betas. This figure is based on a double sequential mediation model analyzed using PROCESS Version 4.2 (Hayes, 2022).*

Exploratory Analyses

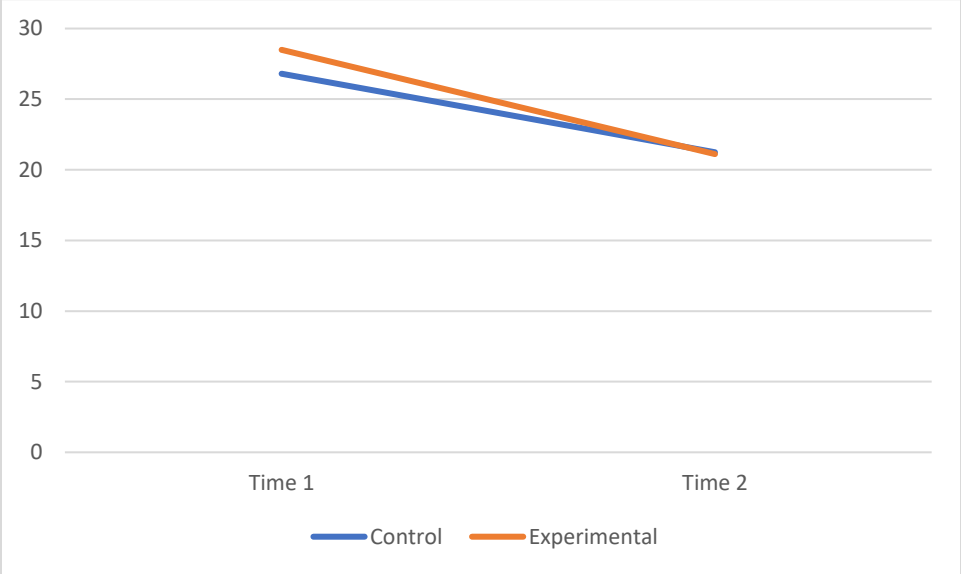
Reactance

An independent samples t-test was performed to evaluate the difference in reactance scores between the control group (M = 26.32, SD = 5.93, N = 75) and the experimental group (M = 27.09, SD = 6.65, N = 54), these means reflect the sum of scores in the reactance scale items of both the threat to freedom and the emotional components. The Levene's test for equality of variances was not significant, $F(1, 127) = .289$, $p = .592$, indicating no significant difference in variances between groups. The t-test for equality of means also indicated no significant

difference in scores between the control and experimental groups, t(127) = -.694, p = .489 (two-tailed), with a mean difference of -.77259 (95% CI [-2.97627, 1.43109]). The effect size was small, with Cohen's d = -.124 (95% CI [-.474, .227]), suggesting minimal practical significance between the groups. The reactance inducement impact on the experimental group was negligible.

An exploratory repeated measures ANOVA was conducted on the entire sample (N = 194), which included those who had prior knowledge of Nootropics and those who chose not to participate in the paid study that was pretext for the inducement of reactance, to examine the effects of condition (control vs. experimental) and time (pre- vs. post-attitude measure) on attitudes towards Nootropic supplements. No significant main effect of time was observed, $F(1, 192) = .002$, $p = .962$. However, there was a significant interaction between time and condition, $F(1, 192) = 5.400$, $p = .021$. This suggests that the change in attitudes from pre to post differed between the control and experimental conditions for this sample that included those who had prior knowledge of what a Nootropic supplement is. The effect size for this interaction, as measured by partial eta squared, was .027, indicating a small effect. There was no significant effect of condition on the dependent variable when averaged across time points, $F(1, 192) = .601$, p = .439. These results suggest that the inducement of reactance had a differential impact on attitudes over time. The significant interaction of time by condition indicated a negative reactance effect. The experimental group changed in a more negative.

Figure 4. Pre- and Post-Message Attitudes over Time



Note: For clarity, the scores used in the graph above were not transformed z scores of the intent scale but actual scores.

Ambivalence

In a further analysis, to assess the ambivalence towards nootropic supplements, an analysis of variance (ANOVA) was conducted using the standard deviation of each participants' scores (n = 129) from each item of the semantic differentials collected at two time points. The within-subjects factor was Time, with two levels: pre-intervention and post-intervention. Before the intervention, the control group showed a mean ambivalence of .8374 (SD = .55375), and the experimental group showed a mean of .8719 (SD = .54448). Following the intervention, the control group's ambivalence decreased to a mean of .7581 (SD = .33721), while the experimental group showed a mean of .6956 (SD = .36262).

A significant main effect of Time was observed on ambivalence scores, $F(1, 127) = 7.820$, $p = .006$, partial $\eta^2 = .058$, indicating that the ambivalence levels changed from pre-

intervention to post-intervention. However, there was no significant Time * Condition interaction, $F(1, 127) = 1.128$, $p = .290$, partial $\eta^2 = .009$, suggesting that this change in ambivalence was consistent across conditions. There was no significant effect of Condition on the transformed variable average of the combined dependent variable, $F(1, 127) = .042$, $p = .837$, partial $\eta^2 = .000$. These analyses included only those participants who opted "yes" to participate in a paid study (from the experimental group), potentially having a stronger basis for experiencing reactance. These findings suggest that while overall ambivalence toward nootropic supplements decreased from pre- to post-message, this change did not differ between those in the control group and those in the experimental condition who may have experienced reactance.

Given the observed reduction in ambivalence towards Nootropic supplements from pre-message to post-message, without significant differences between the control and experimental groups, it is imperative to explore how this change in ambivalence, particularly post-message, interacts within the broader context of persuasive communication effects. This insight served as a logical reason for employing post-message ambivalence scores as a moderator in the subsequent analysis. Specifically, by integrating these scores into a moderated double sequential mediation model, we hoped to elucidate the mechanisms through which condition, message evaluation, and reactance collectively influenced intent. This approach allows us not only to assess the direct and indirect pathways through which experimental conditions affect outcomes but also to understand how individual variations in ambivalence post-message may modulate these relationships, offering a more comprehensive view of the dynamics at play.

Following this identification of a reduction in ambivalence towards nootropic supplements, our investigation further delved into how post-treatment ambivalence may modulate the influence of condition on the intent to use these supplements, through the

mediating roles of message evaluation and reactance. Employing PROCESS Model 59, the analysis sought to unveil the complexities of these relationships among 129 participants.

Using PROCESS Procedure for SPSS Version 4.2, a moderated double sequential mediation with condition as the independent variable, message evaluation and reactance as mediators, intent to use nootropic supplements as the dependent variable, and post-treatment ambivalence serving as the moderator was conducted.

The model summary for message evaluation revealed an overall model significance, $F(3, 125) = 3.800$, $p = .012$, explaining 8.36% of the variance in message evaluation ($R^2 = .0836$). However, the interaction term (Condition x Ambivalence) was not significant, indicating that post-treatment ambivalence did not moderate the relationship between condition and message evaluation.

Similarly, the model containing reactance showed the model to be significant, $F(3, 125) = 3.609$, $p = .015$, with an explained variance of 7.97% ($R^2 = .080$). Again, the interaction between condition and ambivalence showed no significant moderation effect.

The comprehensive model including intent to use nootropic supplements as the outcome yielded significant results, $F(7, 121) = 5.8683$, $p < .0001$, with an explained variance of 25.34% ($R^2 = .253$). Notably, the direct effects of condition on intent, as well as the interaction effects involving post-message ambivalence, did not reach statistical significance.

Discussion

This study set out to examine the potential of psychological reactance to foster positive attitude formation toward neutral stimuli, specifically nootropic supplements. Our findings did not support the hypothesis that reactance in this case could be harnessed to engender a more favorable view of these supplements. Notably, the absence of a significant reactance induction or

clear pathway through which reactance might affect attitude formation necessitates a thorough review of the theoretical and methodological framework employed in the study.

One standout result from the analyses was the role of message evaluation in predicting intent to use Nootropic supplements. The message evaluation was a significant negative predictor of intent, indicating that how participants assessed the information presented to them had a meaningful impact on their subsequent behavioral intentions. This underscores the importance of message framing and presentation in persuasion research, where the perceived credibility and relevance of the message can significantly sway an individual's intent to engage with the product or idea being promoted.

Additionally, our assessment of ambivalence yielded insightful results. Ambivalence towards Nootropic supplements, as measured by the variability in responses on semantic differential scales, was observed to decrease from pre-message to post-message. This reduction in ambivalence could suggest a clarification of attitudes post-message, with participants becoming less conflicted in their views about Nootropics. However, this decrease in ambivalence did not differ significantly between the control group and those in the experimental condition, which might suggest that the message itself helped to solidify attitudes regardless of the experimental manipulation.

The exploration of ambivalence is particularly significant given its potential role in resistance to persuasion. Ambivalence implies cognitive conflict and the coexistence of positive and negative evaluations, which can lead to increased thought and scrutiny of persuasive messages. Although reactance was not found to be a significant mediator in the relationship between experimental conditions and intent, the observed decrease in ambivalence suggests that

participants were processing the information in a way that may have been conducive to attitude change.

The study's limitations are multifaceted, impacting both the interpretability and the generalizability of the findings. First, the potency of the reactance manipulation may not have been sufficient to elicit a measurable reactance response, suggesting the need for a more robust or direct threat to autonomy (Brehm, 1966). Second, the instruments employed to assess reactance and attitude change might not have captured nuanced changes, indicating a potential gap in measurement sensitivity. Third, the perception of the freedom threat by participants may not have aligned with the intended manipulation, diminishing the likelihood of reactance. Fourth, the use of an MTurk sample might not fully represent the broader population's reactions to persuasion attempts. Finally, the repeated measures ANOVA conducted to assess attitude changes towards nootropic supplements used two different scales across time points, with attitudes at time 1 employing a 7-point semantic differential scale and attitudes at time 2 using a 5-point scale. This inconsistency in scaling would have posed a limitation to the study as it affects the comparability and interpretation of the observed changes in attitudes; however, this was resolved by converting to standardized z-scores.

The implications of these findings extend into several areas for future research. Enhanced manipulations that threaten autonomy directly may offer a more accurate assessment of reactance's role in attitude formation. Employing alternative or more nuanced measures of reactance and attitude change could unearth deeper insights into the psychological mechanisms at play. Expanding the participant pool by increasing the sample size and diversity could enhance the findings' external validity. Exploring the effects of varying types and intensities of freedom threats might elucidate the conditions under which reactance more effectively influences

attitudes. Longitudinal study designs could provide a clearer depiction of the persistence and evolution of attitudes formed through reactance. And finally, disentangling the cognitive and affective components of reactance-driven persuasion could enrich our understanding of the interplay between these processes in influencing attitudes.

References

Bohner, G., & Dickel, N. (2011). Attitudes and Attitude Change. Annual Review of Psychology, 62, 391–417. https://doi.org/10.1146/annurev.psych.121208.131609

Brehm, J. W. (1956). Postdecision Changes in the Desirability of Alternatives. The Journal of Abnormal and Social Psychology, 52(3), 384–389. https://doi.org/10.1037/h0041006

Brehm, J. W. (1966). A Theory of Psychological Reactance. Academic Press.

Brehm, S. S., & Brehm, J. W. (1981). Psychological Reactance: A Theory of Freedom and Control. New York: Academic Press.

Brody, B. & Brennan, D. (2022, July 18). Nootropics ("smart drugs" or "cognitive enhancers"): What to know. WebMD. Retrieved November 1, 2022, from https://www.webmd.com/vitamins-and-supplements/features/nootropics-smart-drugs-overview

De Houwer, J. (2007). A Conceptual and Theoretical Analysis of Evaluative Conditioning. The Spanish Journal of Psychology, 10(2), 230–241. https://doi.org/10.1017/S1138741600006491

Dillard, J. P., & Peck, E. (2000). Affect and Persuasion: Emotional Responses to Public Service Announcements. Communication Research, 27(4), 461–495. https://doi.org/10.1177/009365000027004003

Dillard, J. P., & Shen, L. (2005). On the Nature of Reactance and its Role in Persuasive Health Communication. Communication Monographs, 72(2), 144–168. https://doi-org.ccl.idm.oclc.org/10.1080/03637750500111815

Faul F, Erdfelder E, Lang AG, Buchner A. (2007). G*Power 3: A Flexible Statistical Power Analysis Program for the Social, Behavioral, and Biomedical Sciences. Behav Res Methods, 39(2):175-91. doi: 10.3758/bf03193146.

Gawronski, B., & Bodenhausen, G. V. (2006). Associative and Propositional Processes in Evaluation: An Integrative Review of Implicit and Explicit Attitude Change. Psychological Bulletin, 132(5), 692–731. https://doi.org/10.1037/0033-2909.132.5.692

Grandpre, J., Alvaro, E. M., Burgoon, M., Miller, C. H., & Hall, J. R. (2003). Adolescent Reactance and Anti-Smoking Campaigns: A Theoretical Approach. Health Communication, 15(3), 349–366. https://doi.org/10.1207/S15327027HC1503_6

Graupmann, V., Jonas, E., Meier, E., Hawelka, S., & Aichhorn, M. (2012). Reactance, the Self, and its Group: When Threats to Freedom Come From the Ingroup Versus the Outgroup. European Journal of Social Psychology, 42(2), 164–173. https://doi.org/10.1002/ejsp.857

Groenland, E. A. G., & Schoormans, J. P. L. (1994). Comparing Mood-Induction and Affective Conditioning as Mechanisms Influencing Product Evaluation and Product Choice. Psychology & Marketing, 11(2), 183–197. https://doi.org/10.1002/mar.4220110207

Hayes, A. F. (2022). Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach (Vol. 3). The Guilford Press.

Heilman, M. E. (1976). Oppositional Behavior as a Function of Influence Attempt Intensity and Retaliation Threat. Journal of Personality and Social Psychology, 33(5), 574–578. https://doi.org/10.1037/0022-3514.33.5.574

Hohman, Z. P., Crano, W. D., & Niedbala, E. M. (2016). Attitude Ambivalence, Social Norms, and Behavioral Intentions: Developing Effective Antitobacco Persuasive Communications. Psychology of Addictive Behaviors : Journal of the Society of

Psychologists in Addictive Behaviors, 30(2), 209–219. https://doi.org/10.1037/adb0000126

Hohman, Z. P., Crano, W. D., Siegel, J. T., & Alvaro, E. M. (2014). Attitude Ambivalence, Friend Norms, and Adolescent Drug Use. Prevention Science: The Official Journal of the Society for Prevention Research, 15(1), 65–74. https://doi.org/10.1007/s11121-013-0368-8

Linder, D. E., & Crane, K. A. (1970). Reactance Theory Analysis of Predecisional Cognitive Processes. Journal of Personality and Social Psychology, 15(3), 258–264. https://doi.org/10.1037/h0029396

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation Analysis. Annual Review of Psychology, 58, 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542

McCroskey, J. C., Pricitard, S. V. O., & Arnold, W. E. (1967). Attitude Intensity and the Neutral Point on Semantic Differential Scales. Public Opinion Quarterly, 31(4), 642. https://doi-org.ccl.idm.oclc.org/10.1086/267561

Miller, C. H., Lane, L. T., Deatrick, L. M., Young, A. M., & Potts, K. A. (2007). Psychological Reactance and Promotional Health Messages: The Effects of Controlling Language, Lexical Concreteness, and the Restoration of Freedom. Human Communication Research, 33(2), 219–240. https://doi.org/10.1111/j.1468-2958.2007.00297.x

Miller, J., McGregor, L., Currie, S., & O'Carroll, R. E. (2022). Investigating the Effects of Threatening Language, Message Framing, and Reactance in Opt-Out Organ Donation Campaigns. Annals of behavioral medicine: a publication of the Society of Behavioral Medicine, 56(1), 50–63. https://doi.org/10.1093/abm/kaab017

Miron, A. M., & Brehm, J. W. (2006). Reaktanz theorie - 40 Jahre spärer = Reactance Theory - 40 Years Later. Zeitschrift Für Sozialpsychologie, 37(1), 9–18. https://doi-org.ccl.idm.oclc.org/10.1024/0044-3514.37.1.9

Mühlberger, C., Klackl, J., Sittenthaler, S., & Jonas, E. (2020). The approach-motivational nature of reactance—Evidence from asymmetrical frontal cortical activation. Motivation Science, 6(3), 203–220. https://doi-org.ccl.idm.oclc.org/10.1037/mot0000152

Olson, M. A., & Fazio, R. H. (2001). Implicit Attitude Formation Through Classical Conditioning. Psychological Science, 12(5), 413–417. https://doi.org/10.1111/1467-9280.00376

Olson, M. A., & Fazio, R. H. (2002). Implicit acquisition and manifestation of classically conditioned attitudes. Social Cognition, 20(2), 89–104. https://doi.org/10.1521/soco.20.2.89.20992

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). The Measurement of Meaning (No. 47). University of Illinois press.

Pham, M. T. (1998). Representativeness, Relevance, and the use of Feelings in Decision Making. Journal of Consumer Research, 25(2), 144–159. https://doi.org/10.1086/209532

Priester, J. R., & Petty, R. E. (1996). The gradual threshold model of ambivalence: relating the positive and negative bases of attitudes to subjective ambivalence. Journal of personality and social psychology, 71(3), 431–449. https://doi.org/10.1037//0022-3514.71.3.431

Quick, B. L., & Considine, J. R. (2008). Examining the use of Forceful Language When Designing Exercise Persuasive Messages for Adults: A Test of Conceptualizing Reactance Arousal as a Two-Step Process. Health Communication, 23(5), 483–491. https://doi.org/10.1080/10410230802342150

Quick, B. L., & Stephenson, M. T. (2007). Further Evidence that Psychological Reactance can be Modeled as a Combination of Anger and Negative Cognitions. Communication Research, 34(3), 255–276. https://doi.org/10.1177/0093650207300427

Rains, S. A. (2013). The Nature of Psychological Reactance Revisited: A Meta-Analytic Review. Human Communication Research, 39(1), 47–73. https://doi.org/10.1111/j.1468-2958.2012.01443.x

Rains, S. A., & Turner, M. M. (2007). Psychological Reactance and Persuasive Health Communication: A Test and Extension of the Intertwined Model. Human Communication Research, 33(2), 241–269. https://doi.org/10.1111/j.1468-2958.2007.00298.x

Ratcliff, C. L., Jensen, J. D., Scherr, C. L., Krakow, M., & Crossley, K. (2019). Loss/Gain Framing, Dose, and Reactance: A Message Experiment. Risk Analysis, 39(12), 2640–2652. https://doi.org/10.1111/risa.13379

Riedel, A. S., Weeks, C. S., & Beatson, A. T. (2023). Dealing with Intrusive Ads: A Study of which Functionalities Help Consumers Feel Agency. International Journal of Advertising: The Review of Marketing Communications. Advance online publication. https://doi.org/10.1080/02650487.2023.2197778

Romanelli, M. N., Galeotti, N., Ghelardini, C., Manetti, D., Martini, E., & Gualtieri, F. (2006). Pharmacological Characterization of DM232 (Unifiram) and DM235 (Sunifiram), New Potent Cognition Enhancers. CNS Drug Reviews, 12(1), 39–52. https://doi-org.ccl.idm.oclc.org/10.1111/j.1527-3458.2006.00039.x

Rosenberg, B. D., & Siegel, J. T. (2018). A 50-year Review of Psychological Reactance Theory: Do Not Read This Article. Motivation Science, 4(4), 281–300. https://doi-org.ccl.idm.oclc.org/10.1037/mot0000091

Ruybal, A. L., & Siegel, J. T. (2021). Increasing Social Support for Women with Postpartum Depression Through Attribution Theory Guided Vignettes and Video Messages: The Understudied Role of Effort. Journal of Experimental Social Psychology, 97, Article 104197. https://doi.org/10.1016/j.jesp.2021.104197

Rydell, R. J., & McConnell, A. R. (2006). Understanding Implicit and Explicit Attitude Change: A Systems of Reasoning Analysis. Journal of Personality and Social Psychology, 91(6), 995–1008. https://doi.org/10.1037/0022-3514.91.6.995

Silvia, P. J. (2005). Deflecting Reactance: The Role of Similarity in Increasing Compliance and Reducing Resistance. Basic and Applied Social Psychology, 27(3), 277–284. https://doi.org/10.1207/s15324834basp2703_9

Slavin, M. N., & Earleywine, M. (2019). Effects of Messaging and Psychological Reactance on Marijuana Craving. Substance Use & Misuse, 54(14), 2359–2367. https://doi-org.ccl.idm.oclc.org/10.1080/10826084.2019.1650771

Steindl C, Jonas E, Sittenthaler S, Traut-Mattausch E, Greenberg J. (2015). Understanding Psychological Reactance: New Developments and Findings. Z Psychol, 223(4):205-214. doi: 10.1027/2151-2604/a000222.

Temerdashev, A. Z., Zorina, M. O., Dmitrieva, E. V., & Azaryan, A. A. (2021). A Study of the Metabolism of the New Nootropic Preparation Unifiram by Ultra-High Performance Liquid Chromatography–High-Resolution Mass Spectrometry. Journal of Analytical

Chemistry, 76(2), 204–211. https://doi-org.ccl.idm.oclc.org/10.1134/S1061934821020131

Tennen, H., Press, S., Rohrbaugh, M., & White, L. (1981). Reactance theory and therapeutic paradox: A compliance-defiance model. Psychotherapy: Theory, Research & Practice, 18(1), 14–22. https://doi-org.ccl.idm.oclc.org/10.1037/h0085955

van Harreveld, F., van der Pligt, J., & de Liver, Y. N. (2009). The Agony of Ambivalence and Ways to Resolve it: Introducing the MAID Model. Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc, 13(1), 45–61. https://doi.org/10.1177/1088868308324518

Van Petegem, Stijn & Soenens, Bart & Vansteenkiste, Maarten & Beyers, Wim. (2015). Rebels With a Cause? Adolescent Defiance from the Perspective of Reactance Theory and Self-Determination Theory. Child development. 86. 10.1111/cdev.12355.

Xu, J. (2015). Designing messages with high sensation value: When activation meets reactance. Psychology & Health, 30(4), 423–440. https://doi-org.ccl.idm.oclc.org/10.1080/08870446.2014.977280

Yan, C., Dillard, J. P., & Shen, F. (2010). The Effects of Mood, Message Framing, and Behavioral Advocacy on Persuasion. Journal of Communication, 60(2), 344–363. https://doi.org/10.1111/j.1460-2466.2010.01485.x

Appendix A

Demographics and Vitamin Use Questionnaire

Age: Please select the age range you fall into.

o 18 - 28

o 29 - 39

o 40 - 50

o 50 +

Ethnicity: Please select your ethnicity below.

o White (Non-Hispanic)/ European American

o Hispanic / Latino

o Black or African American

o Asian / Pacific Islander / Asian American

o Native American/Alaskan Native/Indigenous

o Other

Gender: Please select the gender you identify as below.

o Male

o Female

o Non-binary / Other

o Prefer not to say

Vita1: How often do you take vitamins or supplements?

o Never

o Almost never

o Occasionally

- Often
- Everyday

Vita2: Do you prefer to take vitamins with food?

- Yes
- Maybe
- No
- Don't Know

Vita3: Which type of vitamin supplement do you prefer, gummy, pill, or chewable?

- Gummy
- Pill
- Chewable

Vita4: Do you feel like vitamins help you?

- No
- Maybe
- Yes

Appendix B

Attitude Scale Pre

On the scale below you'll notice a line with two different words at each end, like "Good" and "Bad." Depending on how "Nootropic Supplements" makes you feel, click on the line close to the word which feels right to you. If you feel more like the word on the left, click closer to that word. If you feel more like the word on the right, click closer to that word. If you have no particular feeling click somewhere in the middle, click wherever feels right for you. Remember, there's no right or wrong answer; it's all about how you personally feel about "Nootropic Supplements."

Effective (1)(2)(3)(4)(5)(6)(7) Ineffective

Safe (1)(2)(3)(4)(5)(6)(7) Dangerous

Reliable (1)(2)(3)(4)(5)(6)(7) Unreliable

Essential (1)(2)(3)(4)(5)(6)(7) Unnecessary

Natural (1)(2)(3)(4)(5)(6)(7) Synthetic

Beneficial (1)(2)(3)(4)(5)(6)(7) Harmful

Affordable (1)(2)(3)(4)(5)(6)(7) Expensive

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.886	.887	7

Appendix C

Message

The following message is centered on the nootropics, Unifiram and Sunifiram, substances whose studies have indicated a remarkable enhancement in memory and cognitive abilities in rats without any recognized adverse effects. The impending FDA study is projected to confirm these results in human subjects, predicting an uplift in memory and cognitive performance among participants.

Nootropic refers to a substance that augments cognition, memory, and facilitates learning. In layman's language, nootropics are often dubbed "Smart Drugs". Modafinil (Provigil), a type of prescription nootropic, is currently FDA-approved for treating narcolepsy, sleep apnea, and shift work disorder. However, certain studies, like the one by Brody & Brennan MD (2022), propose that it might aid in learning and memory enhancement in healthy individuals. Modafinil appears to be safer than other types of stimulants, although it necessitates further research.

Focusing on Unifiram and Sunifiram, there is empirical support for their effectiveness as cognitive enhancers, as per the study conducted by Romanelli et al. (2006). Moreover, Unifiram is presently in clinical trials as a potential tool for improving memory and inhibiting ailments such as Alzheimer’s disease, attention-deficit disorder, and different types of dementia (Temerdashev et al., 2021). Escalating support among medical professionals suggest a promising future for these substances. However, the outcomes of the current paid trials will play a crucial role in determining whether these nootropics will be introduced to the market as prescription drugs or over-the-counter cognitive supplements.

Appendix D

Message Evaluation Semantic Differential

On the scale below you'll notice a line with two different words at each end, like "Biased" and "Neutral." Depending on how the message you read makes you feel, click on the line close to the word which feels right to you. If you feel more like the word on the left, click closer to that word. If you feel more like the word on the right, click closer to that word. If you have no particular feeling click somewhere in the middle, click wherever feels right for you. Remember, there's no right or wrong answer; it's all about how you personally feel about the message on the previous page.

Believable (1)(2)(3)(4)(5)(6)(7) Unbelievable

Neutral (1)(2)(3)(4)(5)(6)(7) Biased

Informative (1)(2)(3)(4)(5)(6)(7) Uninformative

Interesting (1)(2)(3)(4)(5)(6)(7) Boring

Strong (1)(2)(3)(4)(5)(6)(7) Weak

Relevant (1)(2)(3)(4)(5)(6)(7) Irrelevant

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.887	.892	6

Appendix E

Reactance Inducement

Based on your earlier responses, you have been selected to participate in a paid medical trial for an over the counter nootropic supplement "Unifiram." If you wish to participate please click "Yes" below.

o Yes
o No

React Resp: Unfortunately, the researchers are no longer accepting new participants in the study. Please write a brief sentence as to why you wished to participate in the text box below.

Appendix F

Reactance Scale

Please complete the Likert scale below. A Likert scale is a series of statements you respond to based on how much you agree or disagree. Simply choose the option (usually from "strongly disagree" to "strongly agree") that best reflects your feelings towards each statement.

Strongly Agree (1) Agree (2) Somewhat Agree (3) Neutral (4) Somewhat Disagree (5) Disagree (6) Strongly Disagree (7)

I feel that my freedom to make choices was limited recently.

I am frustrated by recent experiences or interactions.

My current situation is annoying.

I am offended or disturbed by recent events or messages I've encountered.

There might be biases or prejudices in the information or messages I've recently received.

Emotional reactance:

Please indicate on the scale below the extent to which you have felt the following emotions during this survey, from "none of this feeling" to "a great deal of this feeling."

None of this feeling. (1) A little of this feeling (2) Some of this feeling. (3) A great deal of this feeling (4)

Irritated

Angry

Annoyed

Aggravated

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.604	.521	9

Combined Items - Scale of Reactance

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.805	.803	5

Reactance Inducement Items (Feelings of Freedom Loss)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.908	.910	4

Emotional State Reactance Items

Appendix G

Attitude Scale Post

On the scale below you'll notice a line with two different words at each end, like "Good" and "Bad." Depending on how "Nootropic Supplements" makes you feel, click on the line close to the word which feels right to you. If you feel more like the word on the left, click closer to that word. If you feel more like the word on the right, click closer to that word. If you have no particular feeling click somewhere in the middle, click wherever feels right for you. Remember, there's no right or wrong answer; it's all about how you personally feel about "Nootropic Supplements."

Useful (1)(2)(3)(4)(5) Useless

Secure (1)(2)(3)(4)(5) Risky

Dependable (1)(2)(3)(4)(5) Untrustworthy

Required (1)(2)(3)(4)(5) Superfluous

Organic (1)(2)(3)(4)(5) Artificial

Advantageous (1)(2)(3)(4)(5) Detrimental

Economical (1)(2)(3)(4)(5) Costly

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.835	.836	7

Appendix H

Intent Scale

Would you buy a Nootropic Supplement online?

- Very likely
- Likely
- Somewhat likely
- No idea
- Somewhat unlikely
- Unlikely
- Not at all likely

If you could receive a free sample in the mail, would you request a Nootropic Supplement?

- Very likely
- Likely
- Somewhat likely
- No idea
- Somewhat unlikely
- Unlikely
- Not at all likely

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.824	.824	2

Appendix I

Screening Question

Prior to this survey did you know what a Nootropic supplement was?

- ○ Yes
- ○ No