

**It Doesn't Apply to Me, so it Isn't Real:  
People are Likely to Deny Science if it Contradicts their Personality**

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**Abstract**

When science contradicts people's experiences, they often deny the science. Psychological science may be particularly prone to denialism because of its relatively high relevance to people's lives. In two sets of studies ( $N = 637$  from university students and Mechanical Turk workers), we tested whether perceived and actual incongruence between one's personality and scientific findings predict psychological discomfort and science denialism. Participants rated the incongruence (subjective incongruence) between their own personality responses and science, as well as their comfort and denial of the science. Those who experienced more subjective incongruence experienced greater discomfort and reported more science denialism. Those whose personality characteristics were objectively incongruent with the science also experienced greater subjective incongruence, (all studies), discomfort (Study 1A, 1B, and 1C), and science denialism (Study 1A, 1C, and 2B) compared to those with congruent characteristics. Implications regarding denialism of psychological science, and science more broadly, are discussed.

*Keywords:* base rate bias, cognitive dissonance, science denialism, personality

### **It Doesn't Apply to Me, so it Isn't Real:**

#### **People are Likely to Deny Science if it Contradicts their Personality**

People are inundated with scientific findings in the media. Research that is particularly relevant to people's lives (e.g., psychology) can potentially help them understand their world and their selves. Nevertheless, even in the face of concrete findings, people are often not convinced and deny the science. This might be especially true when the research does not match their lived experiences. The goal of the current studies was to investigate how people respond to scientific claims regarding personality that are congruent versus incongruent with their own personality.

Although not a new phenomenon, research on science denialism, and how scientists can address it, has only recently gained prominence. This work has shown that people are skeptical of and deny science for several reasons (for a review, see Rutjens et al., 2018). In combination with misunderstanding statistical averages in psychological findings (McPhetres & Pennycook, 2020), one key reason is that the findings deviate from their identity (Rutjens, et al., 2018) and self-concept (Gebauer et al., 2013; Huddy et al., 2015). Therefore, when presented with findings based on statistical averages that do not comport with their lived experience, it is easier (i.e., takes less cognitive effort) for people to simply say, "It does not apply to me, so it is not real." This reflects the common phenomenon of neglecting base rate information (Kahneman, 2011; Kahneman & Tversky, 1972; Schwarz, 2004).

Kahneman and Tversky's (1973) work on base rate ignorance identified the tendency for people to ignore group tendencies in favor of case-specific information. Additionally, when average tendencies contradict case-specific information, processing is hindered or less fluent, leading to negative attitudes towards new information (Schwarz, 2004; Schwarz et al., 2007). Consequently, people may ignore the non-representative information (i.e., the representativeness

heuristic; Kahneman & Tversky, 1972; Schwarz, 2004). For example, if one reads a news report regarding the average warming of the globe on an unseasonably cold day, it might be harder to reconcile that information, leading to skepticism of the report. Essentially, case-specific information outweighs statistical base rates or, as Kahneman (2011) puts it, “what you see is all there is” (p. 85).

A second process also impacts attitudes resulting from contradictions: cognitive dissonance (Festinger, 1962; Steele & Liu, 1983). Dissonance oftentimes manifests itself as psychological discomfort, which the individual consequently attempts to assuage (Elliot & Devine, 1994) by changing the behavior, changing the belief, or adding a new belief (Festinger, 1962). Most work suggests that people add new beliefs—e.g., the new information is opinion rather than fact—especially when the argument in favor of the new information is strong (Goldberg et al., 2020). This added belief results in the individual rejecting (or even ignoring; Goldberg et al., 2020) the contradicting information (Kaplan et al., 2016).

To date, science denialism research has focused on dissonant messages from general scientific findings. However, because social psychological and personality science specifically deals with people’s lives as they are lived, people undoubtedly have more experience and interest in these findings. Indeed, on social media platforms like Reddit, interest in psychology often supersedes other scientific disciplines (McPhetres, 2019). Nevertheless, given the replication crisis (and other potential issues) within psychological research (Lilienfeld, 2012; Wingen et al., 2020), a non-negligible amount of people remains skeptical of psychological findings (Ferguson, 2015; McPhetres & Pennycook, 2020), enough to cause concern among the psychological science community.

We propose that when the average person reads about the latest finding from personality psychology suggesting that “x type of person is more likely to perform y behavior (or hold y belief),” they may neglect the statistical tendencies, in favor of comparing the findings to their lived experiences (i.e., base-rate neglect). Should the findings contradict their personal experience, they will be more likely to experience discomfort (i.e., cognitive dissonance) and deny the science to reduce this discomfort.

### **Current Investigation**

In two sets of studies, we tested if inconsistencies between participants’ personal experiences and personality psychology findings relate to discomfort and science denial. Participants responded to two individual difference measures—self-location and God-belief in Study 1 and conscientiousness and lateness in Study 2—and read about research findings regarding the association between the two characteristics in each study. They then reported their discomfort, science denialism, and confidence in their responses to the individual difference measures (Studies 1C, 2A, and 2B).

We were primarily interested in participants’ “subjective incongruence”—the perceived inconsistency between their personal experience and the research findings—as it relates to denialism. Secondly, we assessed participants’ objective incongruence—the degree to which their scores *actually* fail to conform to the findings. We hypothesized the following:

*Hypothesis 1:* Participants’ subjective incongruence will be positively associated with psychological discomfort and science denialism.

*Hypothesis 2:* Objective incongruence will positively predict subjective incongruence, discomfort, and science denialism.

Predictor and outcome measures for all studies are provided in the Electronic Supplementary Materials (ESM). Data from participants who completed the studies in their entirety were included for analysis. Moreover, unless specified otherwise, we report all measures, either in-text or in the ESM, and all studies conducted for this project. We did not preregister the studies. All data and R code can be accessed through the Open Science Framework: [https://osf.io/rpumh/?view\\_only=c09e3e5bac2a4b819be74f21e8312a51](https://osf.io/rpumh/?view_only=c09e3e5bac2a4b819be74f21e8312a51).

### **STUDIES 1A – 1C: SELF-LOCATION AND GOD-BELIEF**

In Studies 1A-1C, we tested our hypotheses with personality findings that are central to one's identity: God-belief (Sedikides & Gebauer, 2014) and self-location (Adam et al., 2015). Research on self-location shows that people tend to locate their sense of self in either their head or heart (Limanowski & Hecht, 2011). Studies forcing people to endorse their self's location found that head-locators tended to score higher on rationality and interpersonal coldness, while heart-locators tended to score higher on intuition and interpersonal warmth (Fetterman & Robinson, 2013). Importantly, recent work also found that heart-locators (vs. head-locators) consistently score higher on God-belief, likely due to their intuitive and agreeable tendencies (Fetterman et al., 2020). Of course, many head-locators believe in God and many heart-locators do not. Therefore, in Studies 1A-1C, we tested whether such incongruencies versus congruencies predict discomfort and the denial of the research of Fetterman et al. (2020). In Study 1B, while replicating Study 1A, we explored how incongruence relates to behavior intentions. However, these variables were exploratory, so we did not have explicit hypotheses for them. We, therefore, report them in the ESM.

In Study 1C, while replicating Studies 1A and 1B, we also tested whether incongruence would predict participants' confidence in their own self-reported responses on both measures.

Although earlier findings suggest overconfidence can be a motivational tool to reduce dissonance (Blanton et al., 2001), more recent work shows that people report decreased confidence when providing intuitive responses to problems that contradict the correct response (De Neys et al., 2011). Therefore, we also hypothesized that subjective (Hypothesis 3) and objective (Hypothesis 4) incongruence would negatively predict confidence in participants' responses.

## Method

### Participants

In Studies 1A and 1B, we utilized a convenience sample of participants recruited from the University of Texas at El Paso (UTEP) who participated for psychology course credit. In Study 1A, 150 completed the study in its entirety (90 female, 59 male, 1 unreported; age:  $M = 20.21$ ,  $SD = 3.29$ ). In Study 1B, 111 (75 female, 36 male; age:  $M = 19.83$ ,  $SD = 3.19$ ) completed the study. In Study 1C, we collected data from a convenience sample of 128 participants (46 female, 82 male; age:  $M = 34.56$ ,  $SD = 10.91$ ) from Amazon's Mechanical Turk (MTurk), who were paid .25 USD (for a 3-minute study). All three studies were approved by UTEP's Institutional Review Board. Because we did not determine our desired sample sizes a priori, we ran a sensitivity analysis to determine a minimum effect size at power = .80 for our sample size regarding our primary hypotheses. This analysis determined a minimum effect size—when  $\alpha = .05$  (two tailed)—of  $r_{1A} = .158$ ,  $r_{1B} = .187$ , and  $r_{1C} = .174$  for correlations; and  $f^2_{1A} = .053$ ,  $f^2_{1B} = .072$ , and  $f^2_{1C} = .062$  for linear regressions.

### Materials

#### *God-Belief and Self-Location*

We assessed both predictor variables, self-location (head vs. heart) and God-belief, using two single-item measures. For the *self-location* item (Fetterman & Robinson, 2013), participants

responded to a binary question: “Regardless of what you know about biology, which body part do you most closely associate with your ‘self’?” Participants who identified as “heart” locators received a score of 1 ( $n_{IA} = 84$ ;  $n_{IB} = 57$ ;  $n_{IC} = 29$ ), while those who identified as “head” locators, a score of 2 ( $n_{IA} = 66$ ;  $n_{IB} = 54$ ;  $n_{IC} = 99$ ). Participants indicated their level of *God-belief* on a single-item scale adopted from Dawkins’ (2006) theism scale, which ranges from 1 (“Strong Atheist”) to 7 (“Strong Theist”), with 4 being “Pure Agnostic” ( $M_{IA} = 5.99$ ,  $SD_{IA} = 1.51$ ;  $M_{IB} = 5.85$ ,  $SD_{IB} = 1.50$ ;  $M_{IC} = 3.92$ ,  $SD_{IC} = 2.27$ ).

### ***Outcome Variables***

Participants responded (1 = none at all to 5 = a great deal) to a single item measuring their subjective (or perceived) incongruence (“How much do your responses correspond with the recent research?”) between their personality and the findings ( $M_{IA} = 2.70$ ,  $SD_{IA} = 1.51$ ;  $M_{IB} = 2.64$ ,  $SD_{IB} = 1.39$ ;  $M_{IC} = 2.51$ ,  $SD_{IC} = 1.48$ ). They also indicated (1 = extremely comfortable to 7 = extremely uncomfortable) how uncomfortable (i.e., dissonance) they felt regarding the research ( $M_{IA} = 3.53$ ,  $SD_{IA} = 1.17$ ;  $M_{IB} = 3.37$ ,  $SD_{IB} = 1.21$ ;  $M_{IC} = 3.12$ ,  $SD_{IC} = 1.32$ ). Finally, we assessed participants’ attitudinal responses to the research and their overall rejection of the validity of its findings. To do so, we originally created a six-item *science denialism* measure. Specifically, participants rated on a 7-point scale how much they *liked* the findings (1 = dislike a great deal to 7 = like a great deal), how *skeptical* they were of the findings, and how *believable*, *useful*, *biased*, and *scientific* they felt the research was (1 = extremely [unskeptical, unbelievable, useless, unbiased, unscientific] to 7 = extremely [skeptical, believable, useful, biased, scientific]). However, disliking the research may not translate to science denial. Indeed, an exploratory factor analysis of all the items across all studies (see ESM) indicated that the liking item loaded highly on both the denialism and discomfort factors. Therefore, we removed this



item from the denialism scale, but report the analyses using the 6-item measure in the ESM. All items except those measuring *bias* and *skepticism* were reverse scored, such that higher scores indicate greater levels of science denialism ( $M_{1A} = 3.74$ ,  $SD_{1A} = .82$ ,  $\alpha_{1A} = .68$ ;  $M_{1B} = 3.73$ ,  $SD_{1B} = .89$ ,  $\alpha_{1B} = .73$ ;  $M_{1C} = 3.60$ ,  $SD_{1C} = 1.06$ ,  $\alpha_{1C} = .78$ ).

In Study 1C, for the self-location rating, participants answered the question, “How confident are you in your response about self-location?” on a five-point scale ( $M = 4.23$ ,  $SD = .93$ ; 1 = not at all to 5 = a great deal). For God-belief, participants answered the question, “How confident are you in your response about God belief?” with the same five-point scale ( $M = 4.27$ ,  $SD = .89$ ). Participants then answered two binary (i.e., yes/no) questions—one for self-location and one for God-belief—asking them if they would like to change their self-location and God-belief responses. Only two participants indicated that they would like to change their self-location answer and no participants indicated that they would like to change their God-belief answer. Therefore, we dropped these measures from analysis.

### ***Exploratory Outcome Variables***

We also assessed participants’ levels of felt valence and arousal in Studies 1A-1C as exploratory outcomes. Participants completed the valence ( $M_{1A} = 6.32$ ,  $SD_{1A} = 1.89$ ;  $M_{1B} = 6.58$ ,  $SD_{1B} = 1.35$ ;  $M_{1C} = 5.92$ ,  $SD_{1C} = 1.73$ ) and arousal ( $M_{1A} = 3.25$ ,  $SD_{1A} = 2.08$ ;  $M_{1B} = 3.13$ ,  $SD_{1B} = 2.06$ ;  $M_{1C} = 3.39$ ,  $SD_{1C} = 1.82$ ) items of the Self-Assessment Manikin on a nine-point scale (Bradley et al., 1994; Hodes et al., 1985; Lang et al., 1980; see ESM for materials).

### **Procedure**

For Studies 1A-1C, participants first completed the self-location and God-belief measures within a brief sociodemographic questionnaire. They then received a summary of the research

regarding the link between self-location and God-belief along with a reminder of their self-reported scores on each variable in the following manner:

In one of the previous questions, you were asked where you think your "self" is located.

You responded with [participant's response].

Recent research has shown that those who respond "Brain" (or "Head") to the self-location measure tend to believe in God to a lesser extent and are more likely to be pure agnostic or atheist. On the other hand, those who respond "Heart" to the self-location measure tend to believe in God to a greater extent or are weak to strong theists.

You also answered a question about your God belief. Your response was [participant's response].

They then completed the measures assessing their discomfort, subjective incongruence, science denialism, confidence in their self-location and God-belief (Study 1C), and the exploratory variables—valence and arousal.

## Results

### Correlations

To assess the initial relationships, we computed zero-order correlations. As found in Fetterman et al. (2020), self-location correlated with God-belief, such that those who self-identified as "heart" locators scored higher on God-belief in all three studies,  $r_{1A}(150) = .357, p < .001, 95\% \text{ CI } [.209, .489]$ ;  $r_{1B}(111) = .360, p < .001, 95\% \text{ CI } [.186, .512]$ ; and  $r_{1C}(128) = .332, p < .001, 95\% \text{ CI } [.168, .478]$ .

Supporting Hypothesis 1, in all three studies, subjective incongruence was positively correlated with discomfort,  $r_{1A}(150) = .388, p < .001, 95\% \text{ CI } [.243, .516]$ ;  $r_{1B}(111) = .375, p < .001, 95\% \text{ CI } [.203, .525]$ ; and  $r_{1C}(128) = .312, p < .001, 95\% \text{ CI } [.147, .461]$ ; and science

denialism,  $r_{1A}(150) = .415, p < .001, 95\% \text{ CI } [.273, .539]$ ;  $r_{1B}(111) = .359, p < .001, 95\% \text{ CI } [.184, .511]$ ; and  $r_{1C}(128) = .401, p < .001, 95\% \text{ CI } [.244, .537]$ . Moreover, discomfort was positively correlated with science denialism,  $r_{1A}(150) = .482, p < .001, 95\% \text{ CI } [.349, .596]$ ;  $r_{1B}(111) = .418, p < .001, 95\% \text{ CI } [.251, .560]$ ; and  $r_{1C}(128) = .462, p < .001, 95\% \text{ CI } [.314, .588]$ . Additionally, in Study 1C, subjective incongruence was negatively correlated with participants' confidence in their self-location,  $r(128) = -.276, p = .002, 95\% \text{ CI } [-.429, -.108]$ ; and God-belief,  $r(128) = -.272, p = .002, 95\% \text{ CI } [-.425, -.103]$ .

### **Moderated Regression**

To test Hypotheses 2 and 4, we regressed each outcome variable on God-belief (standardized), self-location (dummy-coded: heart = 0, head = 1), and their interaction (see Tables 1-3 for the regression models for each outcome variable). As hypothesized, self-location significantly interacted with God-belief in predicting subjective incongruence and discomfort in all three studies and science denialism in Studies 1A and 1B, but not 1C. Moreover, there was a significant interaction in predicting participants' confidence in their self-location and God-belief scores.

**Table 1**

*Study 1A Interaction Effects of Self-Location and God-belief on Research Reaction Outcomes*

Model: Outcome	Predictors	$F(3,146)$	$b$ [95% CI]	$t$	$f^2_{\text{part}}$
1. Subjective Incongruence		38.56***			
	SL		.1250 [.850, 1.649]	6.19***	.288
	GB		-.931 [-1.314, -.549]	-4.81***	.090
	SL × GB		1.756 [1.310, 2.203]	7.78***	.414
2. Discomfort		9.97***			
	SL		.694 [.316, 1.072]	3.63***	.087
	GB		-.322 [-.684, .041]	-1.75	.037
	SL × GB		.736 [.313, 1.159]	3.44***	.081
3. Science Denialism		4.75**			
	SL		.293 [.016, .570]	2.09*	.042
	GB		-.286 [-.552, -.020]	-2.13*	.002
	SL × GB		.439 [.129, .748]	2.80**	.054

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "SL" = Self-Location; "GB" = God-Belief.

**Table 2**

*Study 1B Interaction Effects of Self-Location and God-belief on Research Reaction Outcomes*

Model: Outcome	Predictors	$F(3,107)$	$b$ [95% CI]	$t$	$f^2_{\text{part}}$
1. Subjective Incongruence		18.42***			
	SL		.902 [.436, 1.368]	3.84***	.193
	GB		-.868 [-1.271, -.464]	-4.27***	.007
	SL × GB		1.449 [.955, 1.942]	5.82***	.317
2. Discomfort		3.13*			
	SL		.158 [-.321, .637]	.65	.020
	GB		-.555 [-.969, -.140]	-2.65**	.013
	SL × GB		.622 [.115, 1.129]	2.43*	.055
3. Science Denialism		2.94*			
	SL		.078 [-.273, .430]	.44	.013
	GB		-.406 [-.710, -.102]	-2.65**	.010
	SL × GB		.474 [.102, .846]	2.53*	.060

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "SL" = Self-Location; "GB" = God-Belief.

**Table 3**

*Study 1C Interaction Effects of Self-Location and God-belief on Research Reaction Outcomes*

Model: Outcome	Predictors	$F(3,124)$	$b$ [95% CI]	$t$	$f^2_{\text{part}}$
1. Subjective Incongruence		51.06***			
	SL		-.141 [-.631, .349]	-.57	.016
	GB		-1.068 [-1.477, -.660]	-5.17***	.459
	SL × GB		2.255 [1.795, 2.714]	9.71***	.760
2. Discomfort		4.78**			
	SL		.231 [-.387, .849]	.74	.010
	GB		-.243 [-.758, .272]	-.93	.058
	SL × GB		.712 [.133, 1.292]	2.43*	.048
3. Science Denialism		7.78***			
	SL		.254 [-.224, .733]	1.05	.001
	GB		.178 [-.221, .577]	.88	.172
	SL × GB		.314 [-.135, .763]	1.39	.015
4. Self-Location Confidence		4.49**			
	SL		.590 [.156, 1.025]	2.69**	.028
	GB		.452 [.090, .814]	2.47*	.003
	SL × GB		-.639 [-1.046, -.232]	-3.11**	.078
5. God-Belief Confidence		6.19***			
	SL		.286 [-.126, .697]	1.37	.000
	GB		.549 [.206, .892]	3.17**	.011
	SL × GB		-.810 [-1.195, -.424]	-4.15***	.139

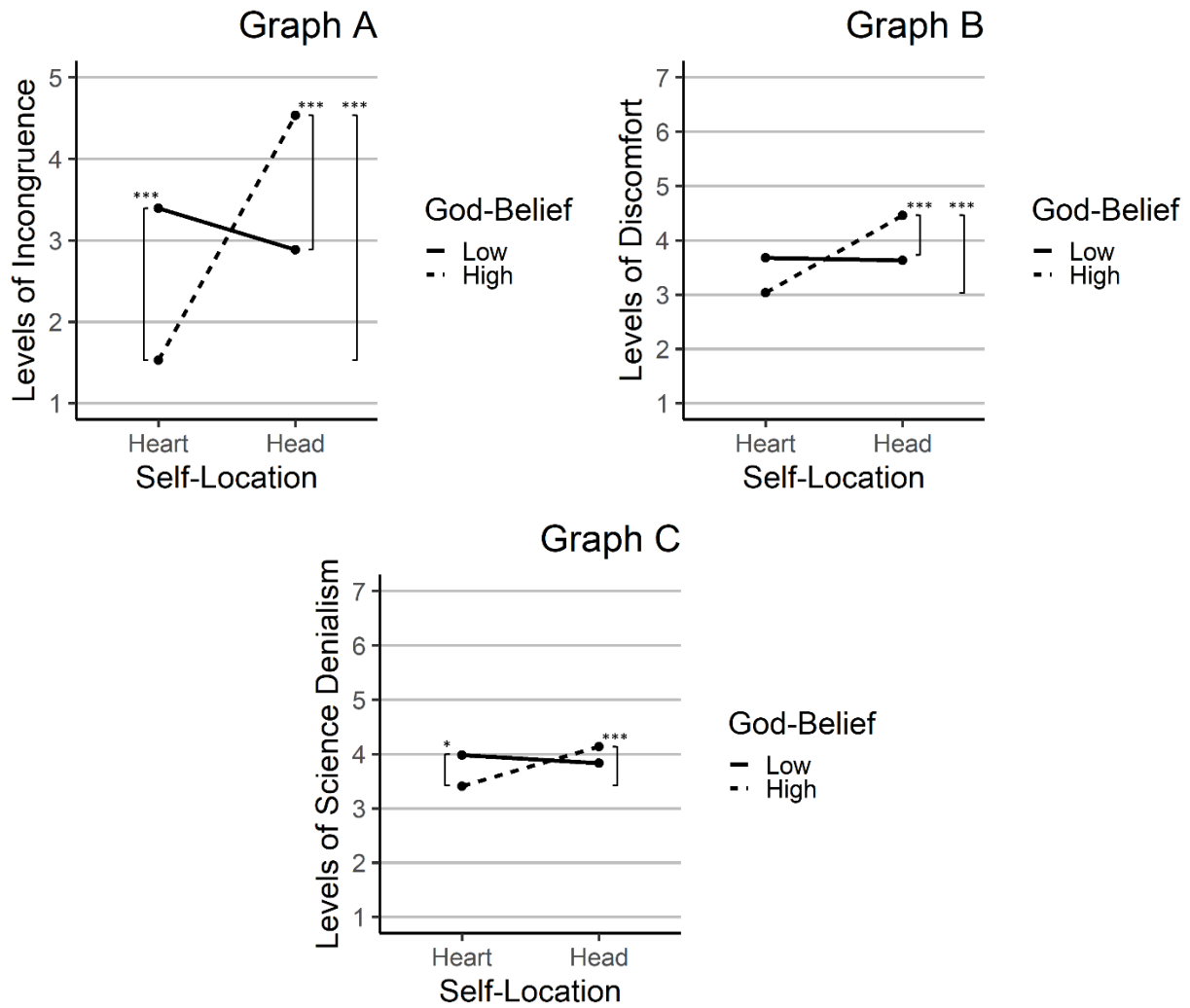
\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "SL" = Self-Location; "GB" = God-Belief.

To analyze the differences within each interaction, we first estimated the means for those who scored high (+1 *SD*) and low (-1 *SD*) on God-belief and those who identified as heart- and head-locators (Aiken & West, 1991). We then analyzed the simple slopes (Table 4) for each significant interaction (Figures 1-3). The patterns generally matched Hypotheses 2 and 4. Head-locators (vs. heart-locators) high in God-belief and heart-locators (vs. head-locators) low in God-belief tended to score higher on subjective incongruence, discomfort, and science denial. Furthermore, head-locators (vs. heart-locators) low in God-belief were more confident in their self-location and God-belief. Confidence did not differ by self-location for those high in God-belief.

**Figure 1**

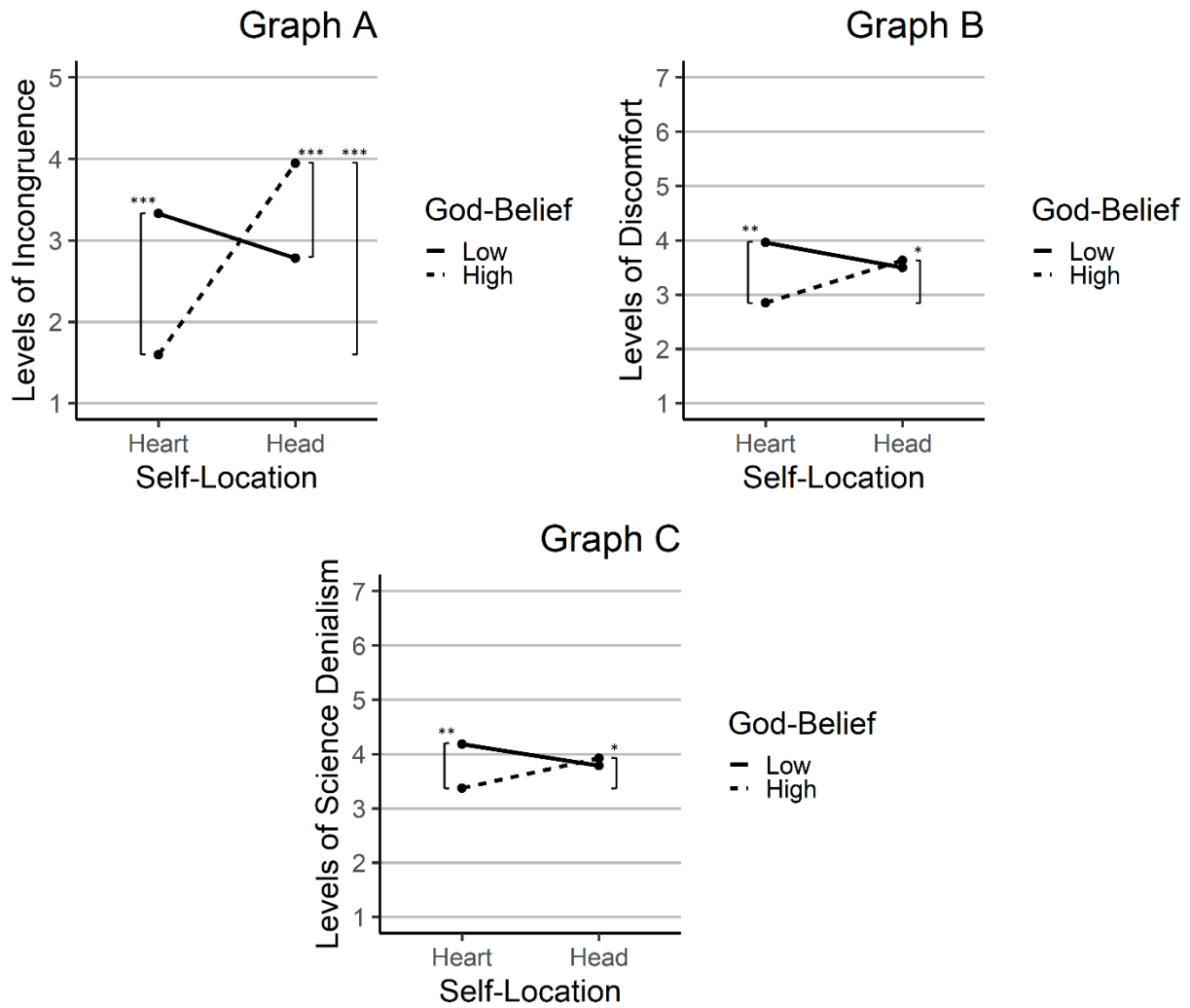
*Study 1A Significant Interactions between Self-Location and God-Belief*



Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Figure 2**

*Study 1B Significant Interactions between Self-Location and God-Belief*

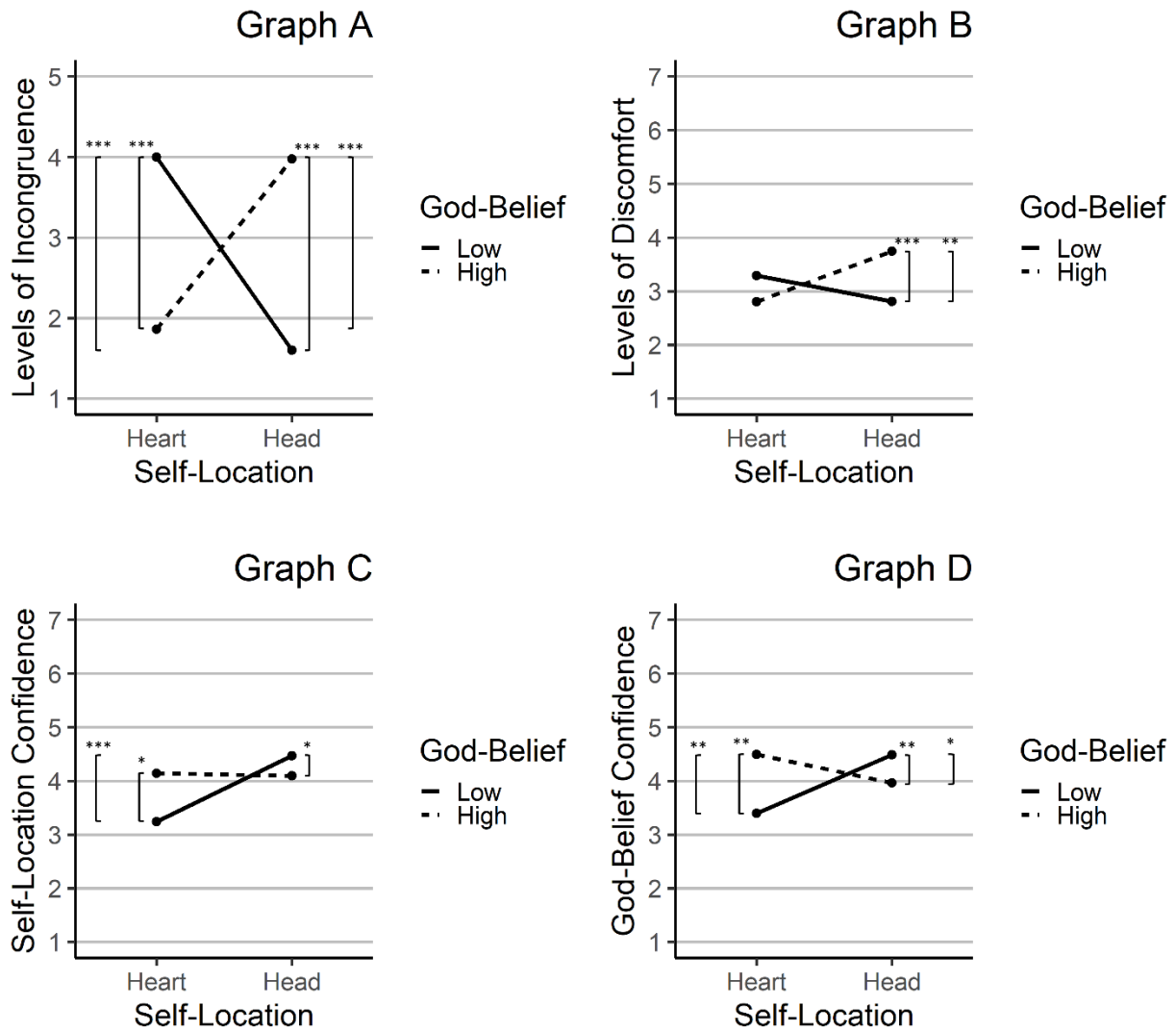


Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



**Figure 3**

*Study 1C Significant Interactions between Self-Location and God-Belief*



Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 4***Study 1 Simple Slopes for Significant Interactions*

Outcome	Predictor	Level of Moderator	Study 1A		Study 1B		Study 1C	
			<i>t</i>	<i>b</i> [95% CI]	<i>t</i>	<i>b</i> [95% CI]	<i>t</i>	<i>b</i> [95% CI]
Incongruence	SL	Low GB	-1.57	-.507 [-1.146, .133]	-1.51	-.547 [-1.265, .170]	-5.93***	-2.396 [-3.196, -1.596]
		High GB	10.70***	3.006 [2.450, 3.561]	7.31***	2.351 [1.713, 2.988]	8.15***	2.114 [1.601, 2.627]
	GB	Heart	-4.81***	-.931 [-1.314, -.549]	-4.27***	-.868 [-1.271, -.465]	-5.17***	-1.068 [-1.477, -.660]
		Head	7.10***	.825 [.595, 1.054]	4.05***	.581 [.297, .866]	11.15***	1.186 [.976, 1.397]
Discomfort	SL	Low GB	-.14	-.042 [-.648, .563]	-1.25	-.464 [-1.201, .273]	-.94	-.481 [-1.490, .527]
		High GB	5.37***	1.430 [.904, 1.955]	2.36*	.780 [.124, 1.435]	2.89**	.943 [.297, 1.590]
	GB	Heart	-1.75	-.322 [-.684, .041]	-2.65**	-.555 [-.969, -.140]	-.93	-.243 [-.758, .272]
		Head	3.77***	.414 [.197, .632]	.45	.067 [-.225, .359]	3.50***	.469 [.204, .735]
Science Denialism	SL	Low GB	-.65	-.146 [-.589, .298]	-1.45	-.396 [-.937, .145]	-	-
		High GB	3.75***	.731 [.346, 1.117]	2.28*	.552 [.071, 1.033]	-	-
	GB	Heart	-2.13*	-.286 [-.552, -.020]	-2.65**	-.406 [-.710, -.102]	-	-
		Head	1.89	.153 [-.007, .312]	.63	.068 [-.146, .283]	-	-
Self-Location Confidence	SL	Low GB	-	-	-	-	3.43***	1.229 [.521, 1.938]
		High GB	-	-	-	-	-.21	-.049 [-.503, .406]
	GB	Heart	-	-	-	-	2.47*	.452 [.090, .814]
		Head	-	-	-	-	-1.99*	-.187 [-.374, -.001]
God-Belief Confidence	SL	Low GB	-	-	-	-	3.23**	1.095 [.424, 1.766]
		High GB	-	-	-	-	-2.41*	-.524 [-.955, -.093]
	GB	Heart	-	-	-	-	3.17**	.549 [.206, .892]
		Head	-	-	-	-	-2.92**	-.261 [-.438, -.084]

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ 

Note 1. "SL" = Self-Location"; "GB" = God-Belief.

Note 2. Low GB = -1 SD; High GB = +1 SD.

**Exploratory Analyses**

We first hypothesized a link between subjective incongruence and discomfort and denial of the research. Moreover, we hypothesized that greater objective incongruence would translate to greater subjective incongruence, discomfort, and denialism. However, we have yet to test whether subjective incongruence predicts discomfort and science denialism when holding objective incongruence constant, and vice versa. Therefore, we ran multiple linear regression models, in which we regressed each outcome on subjective incongruence (standardized), self-location (dummy-coded), God-belief (standardized), and the self-location  $\times$  God-belief interaction. Overall, subjective incongruence significantly predicted both discomfort and denialism, while holding objective incongruence constant, which was no longer significant (Table 5).

**Table 5**

*Subjective Incongruence and Objective Incongruence Predicting Discomfort and Science Denialism*

Study	Model: Outcome	Predictors	<i>F</i>	<i>df</i>	<i>b</i> [95% CI]	<i>t</i>	<i>f</i> <sup>2</sup> <sub>part</sub>	
1A	Discomfort		8.75***	4,145				
		Sub. Inc.			.244 [.014, .475]	2.09*	.187	
		SL			.491 [.071, .911]	2.31*	.019	
		GB			-.171 [-.556, .215]	-.87	.013	
		SL × GB			.451 [-.046, .948]	1.79	.022	
	Science Denialism			7.76***	4,145			
		Sub. Inc.			.323 [.160, .487]	3.92***	.209	
		SL			.024 [-.273, .321]	.16	.001	
GB				-.086 [-.359, .187]	-.62	.003		
	SL × GB			.061 [-.291, .413]	.34	.001		
1B	Discomfort		5.11***	4,106				
		Sub. Inc.			.426 [.162, .689]	3.20**	.168	
		SL			-.118 [-.608, .373]	-.48	.000	
		GB			-.290 [-.720, .140]	-1.34	.021	
		SL × GB			.179 [-.379, .738]	.64	.004	
	Science Denialism			4.62**	4,106			
		Sub. Inc.			.294 [.100, .488]	3.00**	.151	
		SL			-.112 [-.474, .250]	-.61	.000	
GB				-.223 [-.540, .094]	-1.39	.017		
	SL × GB			.169 [-.243, .581]	.81	.006		
1C	Discomfort		4.12**	4,123				
		Sub. Inc.			.237 [-.094, .569]	1.42	.111	
		SL			.253 [-.363, .870]	.81	.005	
		GB			-.072 [-.638, .494]	-.25	.011	
		SL × GB			.352 [-.414, 1.118]	.91	.007	
	Science Denialism			8.44***	4,123			
		Sub. Inc.			.377 [.127, .627]	2.99**	.25	
		SL			.290 [-.174, .754]	1.24	.000	
GB				.449 [.023, .876]	2.09*	.063		
	SL × GB			-.259 [-.835, .319]	-.89	.006		

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "Sub. Inc." = Subjective Incongruence; "SL" = Self-Location; "GB" = God-Belief

As for the exploratory analyses regarding valence and arousal, in Studies 1A-1C, (positive) valence (but not arousal) was negatively correlated with subjective incongruence. Objective incongruence predicted valence (but not arousal) in Studies 1A and 1B. Specifically, heart-locators low in God-belief (vs. high in God-belief) and head-locators (vs. heart-locators) high in God belief experienced lower valence (see ESM for a full report).

### **Discussion**

Overall, subjective incongruence positively correlated with discomfort and science denialism in all three studies. Moreover, objective incongruence positively predicted subjective incongruence and discomfort in all three studies and science denialism in Studies 1A and 1B. Finally, our exploratory analyses revealed that subjective incongruence positively predicted discomfort and science denialism above and beyond objective incongruence.

### **STUDIES 2A AND 2B: CONSCIENTIOUSNESS AND LATENESS**

We tested our hypotheses in a second set of two studies using traits that may not be so central to one's identity. This should constitute a more stringent test of our model. Specifically, both studies used the negatively associated traits of conscientiousness and lateness (Ashton, 1998).

### **Method**

#### **Participants**

In both studies, we used a convenience sample of UTEP undergraduates participating in exchange for course credit. We collected data from 128 (96 female, 32 male; age:  $M = 20.10$ ,  $SD = 3.25$ ) participants in Study 2A and 120 (95 female, 25 male; age:  $M = 20.31$ ,  $SD = 3.15$ ) in Study 2B. Both studies were approved by UTEP's Institutional Review Board. As in Studies 1A-1C, we ran a sensitivity analysis to determine a minimum effect size at power = .80 for our

sample size. This analysis determined a minimum effect size—when  $\alpha = .05$  (two tailed)—of  $r_{2A} = .174$  and  $r_{2B} = .179$  for correlations, and  $f^2_{2A} = .062$  and  $f^2_{2B} = .067$  for linear regressions.

## Materials

### *Conscientiousness and Lateness*

To measure *conscientiousness*, participants completed the conscientiousness factor of the previously validated Mini IPIP, which measures the Big Five personality traits (Donnellan et al., 2006;  $M_A = 3.61$ ,  $SD_A = .74$ ,  $\alpha_A = .55$ ;  $M_B = 3.42$ ,  $SD_B = .74$ ,  $\alpha_B = .58$ ). We also measured the other four Big Five characteristics (extraversion, openness, agreeableness, and neuroticism), but since these did not pertain to our hypotheses, we do not report them.

To assess lateness in Study 2A, participants responded to the question, “How often are you late (to meetings, events, obligations)?” Participants responded along the following 5-point scale: 1 = “Between 0% and about 25% of the time,” 2 = “Between 25% and about 50% of the time,” 3 = “Between 50% and 75% of the time,” 4 = “Between 75% and about 95% of the time,” and 5 = “Nearly 100% of the time” ( $M = 1.28$ ,  $SD = .69$ ).

The percentage options participants had to choose from in Study 2A were quantitatively unbalanced and our definition of “lateness” was confusing to participants. Therefore, we adjusted the lateness item for Study 2B. Here, participants gave their percentage of lateness on a slide bar ranging from 0 to 100% ( $M = 26.60$ ,  $SD = 24.89$ ), with the following instructions:

Using the slide bar, please rate from 0% (never) to 100% (always) how often you are late to previously scheduled obligations. These include (but are not limited to) any of the following: meetings, class, work, special events (example: concerts, sporting events, etc.), and events with friends and family. By late, we mean arriving any time after your

scheduled obligation. If you arrive 1 minute after the obligation is scheduled to begin, you are late.

### ***Outcome Variables***

The outcome variables mirrored those of Study 1C. Specifically, we assessed participants' levels of *subjective incongruence* ( $M_A = 2.60$ ,  $SD_A = 1.15$ ;  $M_B = 2.97$ ,  $SD_B = 1.08$ ) between their personality and behavior and the research findings. They then reported their levels of *discomfort* ( $M_A = 3.44$ ,  $SD_A = 1.25$ ;  $M_B = 3.53$ ,  $SD_B = 1.14$ ) and *science denialism* ( $M_A = 3.63$ ,  $SD_A = .79$ ,  $\alpha_A = .67$ ;  $M_B = 3.62$ ,  $SD_B = .74$ ,  $\alpha_B = .62$ ) using the same 5-item measure (see ESM for results using the 6-item measure). We also assessed participants' levels of confidence in their self-reported lateness ( $M_A = 4.29$ ,  $SD_A = .90$ ;  $M_B = 3.58$ ,  $SD_B = 1.11$ ) and conscientiousness responses ( $M_A = 3.48$ ,  $SD_A = 1.09$ ;  $M_B = 3.17$ ,  $SD_B = .98$ ), as we did in Study 1C.

### ***Exploratory Outcome Variables***

We again assessed participants' levels of felt valence and arousal in Studies 2A and 2B. Like Studies 1A-1C, Participants completed the valence ( $M_{2A} = 6.38$ ,  $SD_{2A} = 1.80$ ;  $M_{2B} = 6.13$ ,  $SD_{2B} = 1.72$ ) and arousal ( $M_{2A} = 3.09$ ,  $SD_{2A} = 1.02$ ;  $M_{2B} = 2.88$ ,  $SD_{2B} = 1.92$ ) items of the Self-Assessment Manikin.

### **Procedure**

Participants first completed a brief sociodemographic questionnaire, then completed the measure of lateness followed by the Mini IPIP. They then received a reminder of their self-reported lateness scores followed by a summary of the research regarding the link between conscientiousness and lateness. Since the lateness assessment differed slightly between Study 2A and 2B, so did the wording of the summary regarding the research linking lateness to conscientiousness (see the ESM for both statements). Participants then saw their self-reported

conscientiousness scores. They then completed the measures assessing their discomfort, science denialism, and confidence in their self-reported lateness and conscientiousness scores.

## Results

### Correlations

Contrary to prior work, the negative correlation between conscientiousness and lateness was not significant in Study 2A,  $r(128) = -.133, p = .134, 95\% \text{ CI } [-.300, .041]$ ; or Study 2B,  $r(120) = -.176, p = .055, 95\% \text{ CI } [-.334, .004]$ ; but they were in the right direction. Nevertheless, this relationship was not the primary purpose of the current project, so we proceeded with our primary analyses.

In line with Hypothesis 1, in both studies, subjective incongruence was positively correlated with discomfort,  $r_{2A}(128) = .323, p < .001, 95\% \text{ CI } [.159, .470]$ ; and  $r_{2B}(120) = .315, p < .001, 95\% \text{ CI } [.144, .468]$ ; and science denialism,  $r_{2A}(128) = .330, p < .001, 95\% \text{ CI } [.166, .476]$ ; and  $r_{2B}(120) = .368, p < .001, 95\% \text{ CI } [.202, .513]$ ; and discomfort was positively correlated with science denialism,  $r_{2A}(128) = .458, p < .001, 95\% \text{ CI } [.309, .585]$ ; and  $r_{2B}(120) = .355, p < .001, 95\% \text{ CI } [.188, .502]$ . Additionally, subjective incongruence was negatively correlated with participants' confidence in their conscientiousness scores in both studies,  $r_{2A}(128) = -.499, p < .001, 95\% \text{ CI } [-.619, -.356]$ ; and  $r_{2B}(120) = -.335, p < .001, 95\% \text{ CI } [-.486, -.166]$ ; and their lateness scores in Study 2B,  $r(120) = -.250, p = .006, 95\% \text{ CI } [-.411, -.075]$ ; but not in Study 2A,  $r(128) = -.139, p = .118, 95\% \text{ CI } [-.305, .035]$ .

### Moderated Regression

We performed the same moderated regression analyses on each outcome variable as in Studies 1A-1C. In Study 2A, there was only a significant interaction between conscientiousness and lateness when predicting subjective incongruence (Table 6). In Study 2B, there were



significant interactions between conscientiousness and lateness when predicting participants' subjective incongruence (but not discomfort) as well as science denialism and their confidence in their lateness scores (Table 7).

**Table 6**

*Study 2A Interaction Effects of Conscientiousness and Lateness on Research Reaction Outcomes*

Model: Outcome	Predictors	$F(3,124)$	$b$ [95% CI]	$t$	$f^2_{\text{part}}$
1. Subjective Incongruence		13.80***			
	Consc.		-.437 [-.618, -.256]	-4.77***	.235
	Late.		.152 [-.054, .357]	1.46	.001
	Consc. × Late.		.403 [.175, .631]	3.50***	.099
2. Discomfort		5.22**			
	Consc.		-.339 [-.554, -.125]	-3.13**	.091
	Late.		.170 [-.074, .413]	1.38	.031
	Consc. × Late.		-.094 [-.364, .175]	-.69	.004
3. Science Denialism		2.94*			
	Consc.		-.175 [-.314, -.037]	-2.51*	.054
	Late.		-.028 [-.185, .129]	-.36	.008
	Consc. × Late.		.092 [-.082, .266]	1.05	.009
4. Conscientiousness Confidence		10.02***			
	Consc.		.486 [.309, .663]	5.43***	.218
	Late.		.176 [-.024, .377]	1.74	.017
	Consc. × Late.		.112 [-.110, .335]	1.00	.008
5. Lateness Confidence		4.19**			
	Consc.		.122 [-.033, .278]	1.56	.035
	Late.		-.246 [-.422, -.070]	-2.76**	.063
	Consc. × Late.		-.066 [-.261, .130]	-.67	.004

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "Consc." = Conscientiousness; "Late." = Lateness.

**Table 7**

*Study 2B Interaction Effects of Conscientiousness and Lateness on Research Reaction Outcomes*

Model: Outcome	Predictors	$F(3,116)$	$b$ [95% CI]	$t$	$f^2_{\text{part}}$
1. Subjective Incongruence		2.43			
	Consc.		.081 [-.114, .277]	.82	.010
	Late.		.067 [-.136, .270]	.66	.000
	Consc. × Late.		.241 [.048, .434]	2.48*	.053
2. Discomfort		2.36			
	Consc.		-.199 [-.407, .010]	-1.89	.027
	Late.		.084 [-.132, .299]	.77	.000
	Consc. × Late.		.203 [-.002, .409]	1.96	.033
3. Science Denialism		3.52*			
	Consc.		-.079 [-.213, .053]	-1.19	.003
	Late.		-.077 [-.214, .061]	-1.10	.031
	Consc. × Late.		.170 [.039, .301]	2.57**	.057
4. Conscientiousness Confidence		.70			
	Consc.		.097 [-.086, .280]	1.05	.013
	Late.		-.046 [-.236, .143]	-.48	.003
	Consc. × Late.		.041 [-.139, .222]	.45	.002
5. Lateness Confidence		2.06			
	Consc.		-.113 [-.317, .090]	-1.10	.011
	Late.		-.161 [-.371, .050]	-1.51	.009
	Consc. × Late.		-.199 [-.400, .001]	-1.97	.033

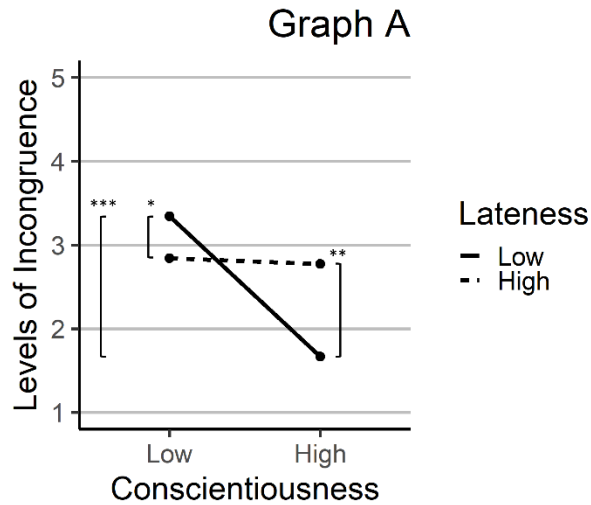
\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "Consc." = Conscientiousness; "Late." = Lateness.

As with the first set of studies, we analyzed the simple slopes (Table 8) of the significant interactions (Figures 4 and 5). In general, high conscientious people who were more (vs. less) late scored higher on subjective incongruence.

**Figure 4**

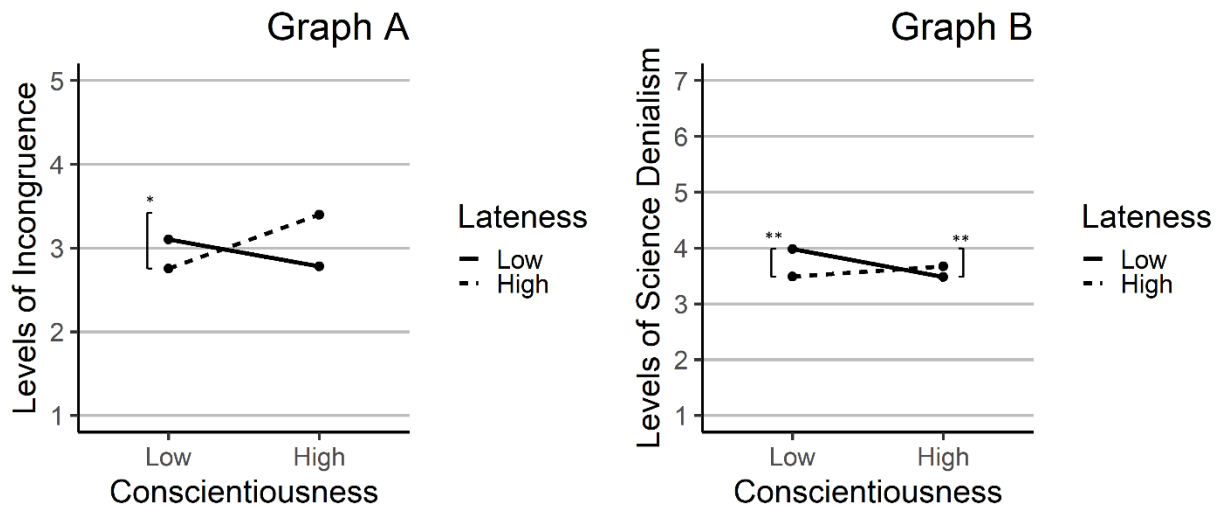
*Study 2A Significant Interactions between Conscientiousness and Lateness*



Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Figure 5**

*Study 2B Significant Interactions between Conscientiousness and Lateness*



Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 8***Study 2 Simple Slopes for Significant Interactions*

Outcome	Predictor	Level of Moderator	Study 2A		Study 2B	
			<i>t</i>	<i>b</i> [95% CI]	<i>t</i>	<i>b</i> [95% CI]
Incongruence	Consc.	Low Late.	-6.20***	-.840 [-1.108, -.571]	-1.10	-.160 [-.448, .127]
		High Late.	-.22	-.034 [-.347, .279]	2.44*	.323 [.061, .584]
	Late.	Low Consc.	-2.26*	-.251 [-.471, -.032]	-1.45	-.174 [-.413, .064]
		High Consc.	2.93**	.555 [.180, .929]	1.93	.309 [-.008, .625]
Science Denialism	Consc.	Low Late.	-	-	-2.53*	-.250 [-.445, -.055]
		High Late.	-	-	1.01	.090 [-.087, .268]
	Late.	Low Consc.	-	-	-3.02**	-.247 [-.409, -.085]
		High Consc.	-	-	.86	.093 [-.121, .308]

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ 

Note 1. "Consc." = Conscientiousness; "Late." = Lateness.

Note 2. Low Late. = -1 *SD*; High Late. = +1 *SD*; Low Consc. = -1 *SD*; High Consc. = +1 *SD*.

**Exploratory Analyses**

We again explored whether objective incongruence predicts discomfort and science denialism when holding subjective incongruence constant, and vice versa. Since subjective incongruence was positively associated with discomfort and science denialism, and objective incongruence predicted subjective incongruence (but not discomfort and science denialism), we suspected subjective incongruence to significantly predict discomfort and science denialism when objective incongruence is included in the same model. We ran multiple linear regression models, in which we regressed each outcome variable on the standardized scores for subjective incongruence, conscientiousness, lateness, and the conscientiousness  $\times$  lateness interaction. Overall, subjective incongruence significantly predicted both discomfort and denialism, while holding objective incongruence constant, which was no longer significant (Table 9).

**Table 9**

*Subjective Incongruence and Objective Incongruence Predicting Discomfort and Science Denialism*

Study	Model: Outcome	Predictors	<i>F</i>	<i>df</i>	<i>b</i> [95% CI]	<i>t</i>	<i>f</i> <sup>2</sup> <sub>part</sub>	
2A	Discomfort		6.70***	4,123				
		Sub. Inc.			.375 [.140, .609]	3.17**	.127	
		Consc.			-.198 [-.423, .028]	-1.74	.033	
		Late.			.120 [-.116, .357]	1.01	.036	
		Consc. × Late.			-.225 [-.499, .048]	-1.63	.022	
	Science Denialism		4.38**	4,123				
		Sub. Inc.			.220 [.068, .372]	2.86**	.124	
		Consc.			-.092 [-.238, .055]	-1.24	.010	
		Late.			-.057 [-.211, .097]	-.74	.007	
		Consc. × Late.			.015 [-.162, .193]	.17	.000	
	2B	Discomfort		4.97***	4,115			
			Sub. Inc.			.354 [.153, .555]	3.48***	.116
Consc.					-.225 [-.425, -.026]	-2.24*	.043	
Late.					.061 [-.145, .268]	.59	.001	
Consc. × Late.					.124 [-.077, .325]	1.22	.013	
Science Denialism			6.90***	4,115				
		Sub. Inc.			.253 [.127, .380]	3.97***	.168	
		Consc.			-.099 [-.224, .027]	-1.56	.011	
		Late.			-.092 [-.223, .038]	-1.41	.034	
		Consc. × Late.			.113 [-.013, .240]	1.77	.027	

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Note. "Sub. Inc." = Subjective Incongruence; "Consc." = Conscientiousness; "Late." = Lateness

In regards to valence and arousal, neither significantly correlated with subjective incongruence in either study. However, objective incongruence significantly predicted arousal (but not valence) in Study 2A. Specifically, high conscientious people who were more (vs. less) late and low (vs. high) conscientious people who were less late experienced higher arousal (see ESM for a full report).

### **Discussion**

Studies 2A-2B partially replicated Studies 1A-1C, albeit using personality traits that are likely less central to one's identity. Most importantly, those who scored high on subjective incongruence tended to score higher on discomfort and science denial. Subjective incongruence was also associated with lower confidence in consciousness ratings in both studies, but only in Study 2B was it associated with confidence in lateness ratings. Further, objective incongruence positively predicted subjective incongruence in both studies. However, associations between objective incongruence and the other outcomes were less consistent. Finally, exploratory analyses for both studies showed that subjective incongruence predicted discomfort and science denialism, above and beyond objective incongruence. Therefore, even though characteristics of conscientiousness and lateness may not be as central to people's self-concept as God-belief or self-location are, the perception that research is incongruent with their own personality is enough to create psychological discomfort and science denial.

### **GENERAL DISCUSSION**

In two sets of studies, we investigated people's science denialism when the science in question contradicts their own lived experience (see Table 10 for a summary of the findings). Participants' perceptions of incongruencies between psychological science and their own characteristics were consistently linked positively to discomfort and science denialism. Objective



incongruence did not always directly translate to discomfort and denialism on its own, even though it consistently predicted subjective incongruence. Indeed, our exploratory findings show that when subjective incongruence is included in the same model, objective incongruence no longer predicts discomfort and denialism. Therefore, it may not be enough for research to be objectively incongruent with people's own experiences. Instead, the mere perception that research findings are incongruent with one's experiences leads to people's overall science denial.

**Table 10***Summary Table of Correlations and Interaction Effects across both Sets of Studies*

Predictor	Outcome Variables	Study (N)									
		1A (150)	1B (111)	1C (128)	2A (128)	2B (120)					
		<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>					
Subjective	Discomfort	.388***	.375***	.312***	.323***	.315***					
Incongruence	Science Denialism	.415***	.359***	.401***	.330***	.368***					
	Self-Location Confidence	-	-	-.276**	-	-					
	God-Belief Confidence	-	-	-.272**	-	-					
	Conscientiousness Confidence	-	-	-	-.499***	-.335***					
	Lateness Confidence	-	-	-	-.139	-.250**					
Discomfort	Science Denialism	.482***	.418***	.462***	.458***	.355***					
		$\beta$	$sr^2$	$\beta$	$sr^2$	$\beta$	$sr^2$	$\beta$	$sr^2$	$\beta$	$sr^2$
Objective	Subjective Incongruence	.875***	.231	.728***	.209	.948***	.340	.403***	.074	.241*	.050
Incongruence (Interaction Effect)	Discomfort	.367***	.067	.312*	.051	.299*	.043	-.094	.003	.203	.031
	Science Denialism	.218**	.049	.238*	.055	.132	.013	.092	.008	.170**	.052
	Self-Location Confidence	-	-	-	-	-.269**	.070	-	-	-	-
	God-Belief Confidence	-	-	-	-	-.340***	.121	-	-	-	-
	Conscientiousness Confidence	-	-	-	-	-	-	.112	.006	.041	.002
	Lateness Confidence	-	-	-	-	-	-	-.066	.003	-.199	.032

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ 

Note 1. Predictors for Interaction Effects: Studies 1A-1C = Self-Location & God-Belief; Studies 2A-2B = Conscientiousness & Lateness.

Note 2.  $sr^2 = \Delta R^2$  between model with interaction and model without interaction.

### **Theoretical and Practical Implications**

In testing a model of science denialism regarding social psychological and personality science, our work intersects literatures on base rate neglect, identity threat, and cognitive dissonance. As people oftentimes exhibit base rate neglect when trying to predict self-relevant behavior (Epley & Dunning, 2000; Moore & Small, 2007), this neglect may be exacerbated by the self-relevance of social psychological and personality science. Psychological science may threaten people's identity and, consequently, facilitate psychological discomfort. To assuage this discomfort, people may be motivated to rely on their own experiences as a more valid source of information than the objective findings (Lewandowski & Oberauer, 2016). Indeed, Washburn and Skitka (2018) show that motivated reasoning (Kunda, 1990) is a mechanism driving one to deny science.

Motivation to reduce dissonance when self-relevant psychological science is incongruent with personal experiences may be one explanation for the public's growing skepticism of the legitimacy of personality and social psychological science (Ferguson, 2015). Our work may also shed light on this ongoing phenomenon. Without fully understanding the nuances of psychological research, media sources who disseminate psychological findings may inflate their significance as well as their implications. This then may facilitate the consumers' misinterpretation of these findings, especially when the findings contradict their lay-theories about psychology. This is problematic as psychology is the science of humans. People relate and compare psychological findings to their own experiences and their experiences with others. Therefore, disseminating misunderstood interpretations of such findings may negatively impact how people view themselves and their interactions with others, as is evidenced by the waning confidence of participants' personality ratings in our studies.

### **Additional Considerations and Future Directions**

Our findings provide a glimpse into the experience of science denialism in response to personality findings. However, several aspects of the current project must be taken into consideration. First, we recruited participants (mostly undergraduates) from the United States, thus limiting our generalizability.

We created the science denialism measure specifically for the current project. Therefore, this measure has not been supported in previous research as a valid and reliable measure of our proposed construct. Future science denialism work should further investigate this new measure.

Finally, given the salience of a polarizing political context, additional empirical research delving into the denial of well-established scientific findings is crucial. For example, research consistently supports the presence and adverse effects of climate change (Stocker et al., 2013). Nevertheless, countless people, including political leaders, disregard these findings as they are incongruent with their own experiences (Hornsey et al., 2016): essentially, since they cannot physically see the effects of climate change or global warming, it does not exist (see also, COVID-19 skepticism). These beliefs could, ultimately, negatively impact the welfare of people across the globe. We found that exposing participants to research incongruent with their experience reduced their confidence in those prior beliefs. These findings offer a hint to an intervention for science denial. Future work should investigate whether this works for other scientific findings.

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