

Documenting Individual Differences in the Propensity to Hold Attitudes with Certainty

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Abstract

The certainty with which people hold their attitudes is an important consideration because attitudes held with certainty better predict judgment and behavior than attitudes held with doubt. However, little is known about whether people's assessments of their certainty reflect a disposition to hold attitudes with confidence. Adapting methods used to document individual differences in people's attitudes, the present research demonstrates that the certainty with which people hold any given attitude is in part a reflection of a relatively stable disposition. Across five studies and six samples (total $N = 106,050$), we demonstrate dispositional variability in attitude certainty and show that it is related to but distinct from confidence in other judgmental domains. We also demonstrate that dispositional attitude certainty may be useful in predicting certainty in newly formed evaluations (Study 3) and an important consequence of certainty – attitude-behavior correspondence (as indicated by reports of behavioral intentions and recent behavior; Study 4 and Student Sample in Study 5). Furthermore, we demonstrate that dispositional attitude certainty is relatively stable over time (Study 5). Results are discussed with respect to potential mechanisms and boundary conditions relating to dispositional attitude certainty, the implications of these individual differences for attitudes and persuasion, as well as the potential origins of dispositional attitude certainty.

Key words: attitudes, attitude certainty, confidence, individual differences, attitude-behavior correspondence

Documenting Individual Differences in the Propensity to Hold Attitudes with Certainty

Certainty – a person’s metacognitive assessment that a thought, feeling, belief, or attitude is valid, clear in one’s mind, or correct – is a key concept in the literature on attitudes and social cognition (Petrocelli, Tormala, & Rucker, 2007; Petty, Briñol, Tormala, & Wegener, 2007). Attitudes (and other judgments) that are held with certainty are better predictors of behavior than attitudes held with doubt (Fazio & Zanna, 1978b; Gross, Holtz, & Miller, 1995; Kraus, 1995; Rucker & Petty, 2004) and are more likely to resist change (Bassili, 1996; Tormala & Petty, 2002). Because of its importance, researchers have devoted a great deal of conceptual and empirical attention to understanding the antecedents and consequences of attitude certainty (also called confidence; for reviews, see Briñol & Petty, 2009; Gross et al., 1995; Visser & Holbrook, 2012).¹ In the present research, we investigate the idea that there may be dispositional tendencies to hold attitudes with a particular level of certainty versus doubt and explore the implications of such individual differences.

Attitude certainty and its origins

The term attitude refers to the evaluations people hold with respect to any given object or issue (Eagly & Chaiken, 1993; Petty, Wheeler, & Tormala, 2003). Attitudes are most commonly assessed using bipolar scales with poles representing extreme negativity and extreme positivity. For example, a person could be asked to rate Mexican food on a seven-point -3 (very bad) to +3 (very good) scale, with zero in the middle. Attitudes can vary in their overall *valence* (i.e., whether they are positive, negative, or neutral toward the object), and their *extremity* (i.e., how extremely positive or negative the attitude is as indicated by its distance from the neutral point).

¹ Note that the terms attitude confidence and attitude certainty are used interchangeably in the literature. To minimize confusion, and to map onto the wording of the questions we most often used to measure the concept, we have chosen to use certainty throughout this paper.

Thus, two people who rate their attitudes as +2 and -2 would have attitudes of a different valence but of the same extremity since both scores are equidistant from zero.

People's attitudes are typically seen as relatively enduring and are considered important because they often impact people's decision making, information processing, and behavior. However, attitudes vary in the extent to which they are enduring and impactful. Those attitudes that are relatively more enduring and impactful are considered "strong" and those that are relatively malleable and lower in impact are considered "weak" (Krosnick & Petty, 1995). That is, even for people who hold attitudes of the same valence and extremity (e.g., +2 or moderately positive), there can be meaningful variability in the strength of the attitude. Indeed, the valence and extremity of an attitude are conceptually orthogonal to its strength, so it is possible for two people to hold relatively neutral (e.g., +1, "it's just OK") attitudes that are very impactful and stable, for example because they are held with high certainty, or to hold relatively extreme (e.g., +3, very positive) attitudes that are not very impactful and are easily changed, for example, because they are held with low certainty. In addition to certainty, a host of other variables have been associated with the strength outcomes of durability and impactfulness, including an attitude's accessibility, importance, ambivalence, degree of elaboration, and a range of other properties (for reviews, see Howe & Krosnick, 2017; Petty & Krosnick, 1995). Interestingly, although many different variables can predict the strength of an attitude, and some of the strength indicators correlate with each other, there does not appear to be a singular "strength" latent concept (Krosnick, Boninger, Chuang, Berent, & Carnot, 1993). However, one of the most heavily studied, and perhaps best understood, variable that can index attitude strength consequences is the certainty with which an attitude is held, and this is the focus of the current research.

Attitudes researchers have long recognized the importance of attitude certainty for understanding attitude-related processes. For example, Sample and Warland (1973) provided an early demonstration that attitudes held with certainty predict behavior better than attitudes held with doubt (for more recent examples, see e.g., Peterson, 2004; Rucker & Petty, 2004). Fazio and Zanna (1978a, 1978b) went on to argue that attitude certainty may be a key mediating variable that could account for the effects of other variables, such as direct experience with an attitude object. Petty, Haugtvedt, and Smith (1995) similarly argued that attitude certainty could be the key mediating variable that accounts for why thoughtfully-formed attitudes are more consequential than those based on little thought. Additional work shows that attitudes held with certainty tend to be more stable over time and resistant to change than those held with doubt (e.g., Bassili, 1996; Petrocelli, Clarkson, Tormala, & Hendrix, 2010), especially if the attitudes are also univalent rather than ambivalent (Clarkson, Tormala, & Rucker, 2008; Luttrell, Petty, & Briñol, 2016). That is, attitude certainty is related to all of the defining features of attitude strength (Krosnick & Petty, 1995). For these reasons, a great deal of research has examined the origins of attitude certainty (for relevant reviews, see Petty et al., 2007; Rucker, Tormala, Petty, & Briñol, 2014).

Some research has examined people's perceptions regarding the way that an attitude was formed that can affect attitude certainty. For example, believing that a particular attitude is based on direct (rather than indirect experience (Fazio & Zanna, 1978) or high versus low amounts of thought (Barden & Petty, 2008) or relatively complete versus incomplete information (Rucker, Petty, & Briñol, 2008; Sanbonmatsu, Kardes, & Herr, 1992) can increase certainty in the attitude. Other research examining the origins of certainty has focused on manipulated situational factors that can affect certainty in any mental construct that is made salient. For example, inductions of happiness versus sadness (Briñol, Petty, & Barden, 2007) or feelings of being powerful rather

than powerless (Durso, Briñol, & Petty, 2016) can influence momentary feelings of certainty that are then misattributed to feelings of certainty in whatever particular attitudes, thoughts, or beliefs are salient.

Still other research has examined individual differences associated with psychological processes that are themselves related to certainty-relevant beliefs. For example, people high in their need for cognition (Cacioppo & Petty, 1982) who report that they enjoy thinking, also are more likely to believe that a given attitude is based on high thought and, as a result, are more likely to have higher certainty in that attitude than people who are low in their need for cognition (Barden & Petty, 2008). In a similar vein, people high in their chronic belief that attitudes tend to be stable (i.e., have an “entity” theory of attitudes), are also more likely to believe that any given attitude is stable and, as a result, come to have more certainty in that attitude than people who tend to believe attitudes are malleable (Petrocelli et al., 2010). These individual differences are linked to certainty through specific thought processes or beliefs. Critically, however, measures of these concepts are not directly measuring attitude certainty themselves, nor do they capture the breadth of predictors of certainty.

Thus, despite existing work examining specific processes or psychological states that can affect certainty in particular attitudes and thoughts, little work has examined dispositional attitude certainty, which we define as the tendency to form and hold many attitudes with a particular level of certainty versus uncertainty. The approach we take in the current research is similar to that taken in prior research on dispositional variability in people’s tendencies to form and hold different attitudes. That is, after many years of focusing on what manipulations and measures were predictive of the attitudes people hold regarding particular attitude objects, researchers discovered that there were individual differences in people’s general tendency to form attitudes varying from very negative to very positive across many different objects. For example, Judge

and Bretz (1993) introduced the Neutral Objects Satisfaction Questionnaire (NOSQ), which assesses attitudes toward 25 relatively neutral objects (e.g., modern art). The summed ratings of these items were then shown to predict novel attitudes such as satisfaction with one's job (e.g., Judge, Locke, Durham, & Kluger, 1998). In a similar vein, Hepler and Albarracín (2013) introduced the Dispositional Attitude Scale (DAS) which assesses attitudes toward 16 different objects (e.g., bicycles, receiving criticism) that vary in their normative attitudes. Overall ratings toward these objects were shown to predict the attitudes formed toward completely new objects. Both the NOSQ and DAS use attitude ratings toward one set of objects to predict attitudes toward other unrelated issues and objects, and these measures appear to be relatively interchangeable for this purpose (Eschleman, Bowling, & Judge, 2015). We adopted a similar approach for our initial foray into examining dispositional attitude certainty.

That is, given the prior research on individual differences in attitudes, we examined the potential for individual differences in attitude certainty by examining whether measured certainty in attitudes toward one set of attitude objects could predict certainty in other, unrelated objects. Compared with past individual difference approaches, such as examining individual differences in the perceived amount of thought (i.e., need for cognition), this approach should allow us to capture the full breadth of variables that might contribute to individual differences in attitude certainty (e.g., dispositional variability in depth of thought, balance of thought, affect, perceived power, etc.). Identifying individual differences in attitude certainty would allow researchers and practitioners to have a new and general predictor of attitude strength outcomes capable of making a priori predictions of attitude-behavior consistency or stability for novel or unrelated topics for which nothing is known in advance. These issues are examined in the current research

Existing Work on Dispositional Certainty

Although no past work has proposed or directly examined individual differences in attitude certainty, some prior work has examined individual differences in other kinds of confidence. For example, research in cognitive psychology has noted that confidence in a variety of unrelated judgments (e.g., in answers to verbal reasoning tests, general knowledge questions, probability estimates) are related to each other (Jackson & Kleitman, 2014; Kleitman & Stankov, 2007). Further, Mirels and colleagues developed a self-report measure of people's confidence in their judgmental *ability* – the judgmental self-doubt scale (JSDS; Mirels, Greblo, & Dean, 2002). Mirels and colleagues found that responses to the JSDS predicted confidence in a wide range of judgments, including moral judgments, estimates of socially relevant parameters (e.g., divorce rates), and so forth. Despite this work documenting the existence of individual differences in confidence, surprisingly, no work has extended these individual differences to attitude certainty, a critical construct in social psychology.² Past research has generally examined confidence in judgments for which there is either a perceived (e.g., moral domain) or actual (e.g., knowledge domain) correct answer, so it is not clear whether individual differences extend to dispositional variation in the certainty of highly subjective attitudinal judgments (e.g., certainty in “I like ice-cream” might not relate to certainty in “I dislike taxes”), and if so, whether the individual differences are domain specific or general.³ The distinction between facts and opinions is a classic

² Interestingly, in work examining sources of confidence in individual judgments, Koriatic and colleagues (Koriatic, 2013; Koriatic & Adiv, 2011) have examined people's preferences/opinions using dichotomous responses. In this work, they noted that there were individual differences in people's tendency to “use relatively high confidence judgments,” which may be analogous to those examined in the current work, but rather than explore these as interesting in their own right, Koriatic and colleagues transformed each participant's confidence judgments to a common scaling to eliminate the influence of individual differences.

³In addition to work on judgmental confidence, related work has examined confidence in terms of the reported likelihood that some outcome will occur (e.g., likelihood I will remember an item I just studied or answer a question correctly; Koriatic, 1997; Løhre & Teigen, 2015; Schraw, 2009; Shanks & Serra, 2014) or in terms of a person's estimated performance compared with his or her actual performance on some test or ability measure (e.g., “overconfidence”; Macenczak, Campbell, Henley, & Campbell, 2016; Moore &

one in social psychology (Jones & Gerard, 1967), and prior research has demonstrated that people can make very different inferences based on each type of information (e.g., Goethals & Nelson, 1973).

Present Research

As noted, certainty in one's attitude clearly is important to understanding the effects of attitudes. Prior research suggests that individual differences in certainty exist, at least in some domains, so it is important to know whether such individual differences are also present in the domain of attitudes and if so, whether they predict attitude-relevant outcomes. The primary goal of this paper is to examine whether or not there are measurable individual differences in attitude certainty. Secondly, we explore the magnitude of associations of dispositional attitude certainty to other individual differences in confidence to gain insight into the extent to which they reflect a single underlying certainty disposition or are distinct-but-related concepts. Third, we examine whether dispositional variability in attitude certainty would allow researchers to predict certainty in new judgments and attitude certainty-related outcomes.

Specifically, we examine for the first time whether certainty in one's attitudes toward a diverse set of attitude objects are related to each other, representing a general disposition to hold attitudes with certainty (all studies) and whether this disposition is stable over time (Study 5). In addition, we examine whether dispositional attitude certainty is related to individual differences in

Cain, 2007). Such approaches are related to, but distinct from our conceptualization of attitudinal certainty. That is, in accord with the dominant view in the literature on attitudes and social cognition (cf., Petty et al., 2007; Yzerbyt, Lories, & Dardenne, 1998), we consider certainty to be metacognitive in nature, and as such, dissociable from the primary cognition about which a person is certain (e.g., a primary cognition of "I predict I will get 90% of the items correct." accompanied by a secondary cognition of "I am moderately certain *in this prediction*."). Likelihood perspectives on confidence either confound these two cognitions or, when compared with an objective outcome (e.g., whether or not a memory item was recalled successfully), equate confidence with overly optimistic predictions, whereas we argue that a person could also have very high confidence or certainty (the secondary cognition) in a prediction that is rather pessimistic (the primary cognition).

confidence or certainty in other kinds of judgments (e.g., fact based; Study 1 & 5) as well as to individual differences in confidence in general, including perceived levels of global confidence (all studies). Further, we examine whether individual differences in attitude certainty can be used to predict certainty in newly formed attitudes (Study 3) or in other attitudes at a later point in time (Study 5). Finally, we explore whether individual differences in attitude certainty can predict important outcomes such as the correspondence between attitudes and either behavioral intentions or retrospective behavioral reports (Study 4 & 5). Together these studies offer compelling initial evidence for the existence and potential importance of individual differences in attitude certainty. We should note that the primary goal of this work is not to develop a scale to measure dispositional attitude certainty. Our assessment strategy, as described above, modifies existing approaches that were used to measure dispositional attitudes to include certainty items. Nonetheless, the instrument we use in our later studies (3-5) presumably would have utility in a wide range of contexts. We discuss the strengths and limitations of our measurement approach in the General Discussion.

Two types of samples were used in this research. Study 1 and one of the Study 5 samples used diverse, non-student participants who completed the study online, with individuals residing primarily in the United States, but also from other countries in Study 1. Our remaining studies used samples of students from public universities in the United States who participated either in person or online. Although the student samples were ethnically diverse, they were limited in terms of their age range (almost exclusively young adults), educational status, and their western cultural context. We sought to maximize power through the use of relatively large sample sizes, and, in the case of Studies 4 and 5, utilization of multiple observations per participant. Study materials, data, and analysis code for all studies can be found at <https://osf.io/s5rcx/>

Study 1

Our first study sought to provide a large assessment of potential individual differences in attitude certainty and, if they exist, their link to other kinds of certainty. Thus, in addition to including measures of certainty in attitudes toward various objects (e.g., favorability toward chess), we also examined confidence in responses to measures of the kinds of judgments used in prior research on individual differences in judgmental confidence (e.g., probability estimates, answers to general knowledge questions). Our goal was to examine the extent to which measures of attitude certainty toward diverse objects hung together, and whether various forms of confidence (e.g., regarding subjective and more objective judgments) are related to each other. In addition, we sought to investigate whether people's reports of their general confidence (i.e., without a domain- or judgment-specific referent) are related to these domain specific measures.

We took advantage of a unique opportunity when the authors of the popular book, the *Confidence Code* (Kay & Shipman, 2014), inquired about our work on certainty and asked for our assistance in identifying and developing a number of relevant questions for a “confidence quiz” on their website. They compiled and then shared with us the responses of people who took the quiz. These data allowed us to examine the extent to which certainty in a range of different judgments – including attitudes – are related to each other, and to do so in a very large and diverse population.

Method

Participants and Demographic variables included. Participants were 103,262 people who completed the quiz on the *Confidence Code* website (<http://theconfidencecode.com/>). The participants were notably mostly female (84,531 female, 18,392 male, 319 other, 21 unknown) and were more educated than the U.S. population (i.e., 2.1% did not graduate high school, 4.9% high school graduate, 13.2% some college, 4.9% associate degree, 36.2% bachelor's degree,

25.4% master's degree, 13.3% doctoral/professional degree).⁴ Nonetheless, the sample still had notable diversity representing a wide range of ages ($M = 38.80$, $SD = 14.33$), religious affiliations (largest groups were 31.3% atheist/agnostic, 19.9% protestant, 17.3% catholic, 3.8% Jewish, 3.7% evangelical Christian, 1.6% Buddhist), marital status (41% single, 47.1% married, 9.1% divorced), race/ethnicity (76.9% white/European/European-American, 3.8% black/African/African-American, 5.8% Asian/Asian-American, 7.3% other/mixed), number of children ($M = .87$, $SD = 1.22$), and personal income levels (28.9% below \$25,000, 20% \$25,000-49,999, 18.7% \$50,000-74,999, 12.1% \$75,000-99,999, 11.3% \$100,000-148,999, 9.1% \$150,000+). Most participants reported currently living in the United States ($n = 81,334$).⁵

Measures. Because of space and time limitations, only very brief measures of each construct were used. When possible, we selected the specific items from an existing scale by using the items with the highest item-total correlations or factor loadings in published papers or unpublished data. Note that with few items in each scale, reliability is relatively low across measures, likely attenuating the magnitude of relationships observed. However, the large sample size in this study offsets some of the limitations of these brief measures. Participants completed the measures in the order described below, and then reported demographic information.

⁴ The gender and education levels observed in this sample likely were obtained because they reflect the audience for the book featured on the website, which was aimed at understanding and addressing confidence in women, primarily in the professional workplace. The data were collected between April 13, 2014 and August 1, 2014.

⁵ Although some participants gave implausible answers to some open-ended questions (e.g., self-reported age of 1, entering a single letter for all open-ended questions) we deleted obviously nonsensical answers at an item level, and attempted to include all otherwise plausible responses. However, when open-ended questions could not be coded, participants' responses to those questions were not used in the relevant analysis. The reduced degrees of freedom in the analyses reported in the online supplement, which used listwise deletion, reflect this.

Attitudes and attitude certainty. The survey began by asking participants to report their attitudes and associated certainty towards each of 4 different unrelated objects (playing chess, public speaking, rugby, and taxes). Attitudes were reported on a 7-point scale anchored at 1 (*extremely unfavorable*) and 7 (*extremely favorable*). After each attitude question, participants reported their certainty in their response on a 7-point scale anchored at 1 (*not at all certain*) and 7 (*extremely certain*). The attitude ratings and associated certainty ratings were then averaged within category to create an overall average attitude score ($\alpha = .33$) and an overall average certainty score ($\alpha = .63$). The specific attitude objects chosen were selected from the Dispositional Attitude Scale (Hepler & Albarracín, 2013), a measure designed to assess individual differences in attitudes. A pilot study that used the full Dispositional Attitude Scale and associated certainty was used to identify which attitude objects to include. The objects chosen were those with the highest average factor loadings of the attitude items on a general attitude factor and the certainty items on a general certainty factor in the pilot study.

Future event likelihood and confidence. Next, participants estimated the likelihood that each of three possible future events would occur (next US president is a woman, manned mission to Mars by 2025, third world war by 2050) and reported their confidence in these judgments. Participants were provided with closed-ended responses labeled with 0%, 10%, 20% and so forth. After each estimate, participants reported how sure they were of their response on a 7-point scale anchored at *extremely unsure* and *extremely sure*. The likelihood estimates ($\alpha = .36$) and associated certainty ($\alpha = .66$) were then averaged. We purposely used synonyms for certainty to make the different question types seem unrelated.

Obscure knowledge and confidence. Next, participants responded to three open-ended factual questions that asked them to estimate various quantities (population of Columbus, OH, age of George Washington when he died, average temperature in Fairbanks, Alaska in August). After

each estimate, participants reported how confident they were in the accuracy of their response on a 7-point scale anchored at *extremely unconfident* and *extremely confident*. Again, a different synonym for certainty was used. The certainty associated with the knowledge question was then averaged ($\alpha = .82$).

Trait self-confidence. Participants indicated their agreement with four statements that asked people to report their level of confidence as a trait (e.g., “I am a confident person.” or “I see myself as full of doubt.”). Items were answered on a 7-point scale, anchored at *extremely disagree this applies to me* and *extremely agree this applies to me*). With these items, we attempted to assess people’s general sense of their own trait level confidence rather than confidence in their decision making ability (i.e., as in judgmental self-efficacy scales). These items were averaged to create an index of trait self-confidence ($\alpha = .87$).

Self-efficacy. Next, participants completed three self-efficacy (Bandura, 1997) items (e.g., “I avoid trying to learn new things when they look too difficult”) from a general measure of self-efficacy (Bosscher & Smit, 1998). Responses were on the same scale as the trait self-confidence measure and were averaged to form a single index ($\alpha = .75$).

Big five. Participants next completed 5 questions taken from the ten-item personality inventory (Gosling, Rentfrow, & Swann, 2003), a brief measure of the “Big Five” personality traits (e.g., Goldberg, 1993). Due to an error when cutting down the survey length, two neuroticism questions were included ($\alpha = .70$), but conscientiousness was omitted.

Self-esteem. Participants completed two items from the Rosenberg Self-esteem Scale (Rosenberg, 1965) ($\alpha = .70$).

Need for cognition and need to evaluate. Participants completed the 2-item need for cognition (NFC; Cacioppo & Petty, 1982) and 3-item need to evaluate (NE; Jarvis & Petty, 1996) items used previously in the 1998 national election study (Bizer, Krosnick, Petty, Rucker, &

Wheeler, 2000). Because each item uses its own response format, items were recoded such that the highest available response was coded as 1 and the lowest was coded as 0, and the intervening responses assigned appropriate values. The relevant items were then averaged to form the NFC ($\alpha = .54$) and NE ($\alpha = .59$) composites.

Results

For descriptive statistics and correlations among variables, see Table 1. We first combined measures by averaging the items for each construct (e.g., attitudes, attitude confidence, event likelihood, event confidence, etc.), reverse coding items as necessary. Note that because these measures were very brief (i.e., no more than 4 questions per scale), reliability was relatively low, ranging from .33 (for the average of the attitude items) to .87 (for the average of the trait self-confidence items). Critically, the fact that the attitude certainty items were correlated with each other ($\alpha = .63$) suggests that there is the potential for a meaningful dispositional attitude certainty construct.

Table 1: Descriptive statistics and correlations among Study 1 variables.

	Variable	M	SD	A	B	C	D	E	F	G	H	I	J	K	L	M
A	Attitudes	4.10	.96													
B	Attitude Cert.	5.70	.91	.09												
C	Event Likelihood	.43	.17	.02	<i>.01</i>											
D	Likelihood Confidence	4.65	1.23	.19	.16	.23										
E	Knowledge Confidence	3.25	1.34	.23	.13	.14	.44									
F	Trait Self-confidence	4.67	1.44	.36	.26	.09	.30	.31								
G	Self-efficacy	5.28	1.24	.32	.19	.06	.23	.21	.48							
H	Self-esteem	4.98	1.57	.22	.21	.05	.20	.23	.64	.40						
I	Need for Cognition	.76	.30	.29	.11	<i>-.01</i>	.14	.15	.29	.46	.23					
J	Need to Evaluate	.66	.26	.14	.11	.08	.17	.15	.24	.14	.14	.17				
K	Extraversion	4.29	1.91	.23	.09	.13	.15	.17	.41	.22	.29	.11	.20			
L	Neuroticism	3.11	1.44	-.24	-.19	-.03	-.18	-.19	-.56	-.42	-.50	-.20	-.04	-.19		
M	Openness	5.66	1.18	.25	.11	.06	.14	.17	.31	.39	.22	.30	.15	.26	-.24	
N	Agreeableness	5.62	1.31	.03	.04	.10	.04	.03	.06	.06	.06	.00	.01	.22	-.11	.17

Note: all items are on 7-point scales except for event likelihood and need for cognition/evaluate (0-1). All correlations not in italics are significant at $p < .001$. Correlations between measures of certainty/confidence are in **bold** to ease identification.

Measures of certainty. Because the reasonable reliability (for such a short measure) suggests there may be a meaningful dispositional attitude certainty construct, we examined the relationship between dispositional attitude certainty and the other measures of certainty/confidence included in this study. First, inspection of the correlation matrix reveals that average attitude certainty showed modest, but significant relationships with all of the other measures of certainty included in the data set, although these were of similar magnitude to correlations with measures of self-esteem and self-efficacy. Thus, it appears that individual differences in attitude certainty are related to individual differences in confidence in other sorts of judgments.

Relationships with other variables. Dispositional attitude certainty was positively related to self-esteem, self-efficacy, need for cognition, and need to evaluate, as well as with the big five factors of extraversion and openness, and negatively with neuroticism. Although speculative, certainty is generally a positive trait and has been previously associated with positive affect (see Briñol et al., 2007), so some of these relationships might be due to positive versus negative affectivity, as extraversion, self-efficacy, and self-esteem tend to be associated with high positive affect, whereas neuroticism is associated with high negative affect (e.g., Watson & Naragon-Gainey, 2014). The “trait self-confidence” measure, the direct self-report of how confident people believe they are, was very strongly related to self-esteem (the strongest relationship of all that we observed, at $r = .64$) and self-efficacy. This was stronger than relationships between this measure and the other measures of certainty, and might reflect lay understandings of “self-confidence” that overlap more heavily with self-esteem than with our metacognitive conceptualization of certainty.

Discussion

Study 1 provided initial support for the view that individual differences in attitude certainty may exist. Specifically, certainty in participants' attitudes towards relatively unrelated topics showed relatively strong intercorrelations with each other. Second, people's dispositional attitude certainty was related to their confidence in a variety of other judgments, though these were only of small to medium magnitude. Of course, this large-scale study had a number of limitations. Foremost among them is that very brief measures of all constructs were employed, likely limiting the reliability of each measure (which can attenuate correlations) and limiting the types of analyses we could conduct. In our next study we sought to more deeply explore dispositional attitude certainty using full-length measures of relevant concepts.

Study 2

The primary goal of our second study was to replicate and extend the findings of Study 1. Specifically, we used full-length measures of relevant constructs to increase reliability and to allow us to examine dispositional attitude certainty using factor analysis with enough items to serve as construct indicators. As noted previously, prior research suggests that there are individual differences in the *positivity versus negativity* of people's evaluative responses (i.e., dispositional attitudes; Hepler & Albarracín, 2013; Judge, 1993; Judge et al., 1998). Because dispositional attitude certainty reflects certainty in those evaluative responses, we examine the extent to which attitude certainty is a trait in comparison to attitudes, and so that we could control for any potential relationship between these dispositions, if necessary. For example, because confidence is generally perceived to be positive, at least in western cultures, it could be that dispositional attitude certainty is largely overlapping with the dispositional tendency to hold more positive attitudes.

Method

Participants. Data were combined across 8 independent data collections using similar measures. Participants were 859 students at a large public university who participated in person. Participants were diverse with respect to gender (320 men, 538 women, 1 unknown) and racial or ethnic background (572 White, 219 Hispanic/Latinx, 71 Asian/Asian American, 56 Black/African American, 19 American Indian/Alaskan Native, 7 Hawaiian/Pacific Islander, 7 other), but not age ($M_{\text{age}} = 19.43$ $SD = 2.55$).⁶ The items described below were included as control or filler measures embedded in each of the 8 data collections. Attitudes and attitude confidence, trait self-confidence, and self-esteem were included in all studies. The other measures described below were included in various subsets of the studies depending on their relevance to the focal study or on the available time remaining in the session. In addition, some participants did not complete all measures. The degrees of freedom in the analyses below reflect this. To maximize power, we included all data sets we could identify that contained the attitude and attitude certainty measures described below as well as at least one other measure of individual differences in confidence. The number of participants who completed each scale is noted in Table 2.

Measures.

Dispositional attitudes and attitude certainty. We measured the attitudes of all participants towards 10 different objects, which had previously been used in other published research (DeMarree, Petty, & Strunk, 2010, Study 2). Participants indicated their attitudes towards each issue on a single 9-point semantic differential scale anchored at 1 (*extremely negative/against*) and 9 (*extremely positive/in favor*). The topics selected were originally chosen

⁶ Different studies used different demographic questions to identify racial or ethnic background. Because some of these studies had different questions and some allowed for multiple responses and some did not; consequently, these numbers are somewhat imprecise but should adequately characterize the aggregated sample.

to represent a likely range of responses in terms of overall evaluation and strength of evaluation (i.e., affirmative action, George W. Bush, paper plates, coffee, college football, Mexican food, Tide Laundry Detergent, sunbathing (tanning), The Pope, and acid rain). For each topic, participants first reported their attitude using the scale above and then immediately indicated their certainty in their attitude on a comparable 9-point scale, anchored at *not at all certain* and *extremely certain*. This was repeated for each of the 10 attitude objects, presented in random order. The attitude ($\alpha = .45$) and attitude certainty ($\alpha = .72$) items were each averaged to form dispositional measures of each concept.

Trait self-confidence and judgmental confidence. We created an ad hoc measure of global self-confidence for the purpose of this research with items similar to those described in Study 1. These items allowed us to further explore the extent to which people are aware of their general tendency to be confident. For this measure, participants indicated the extent to which they agreed with the statements “I am a confident person” and “I am a doubtful person” (reverse scored), on 9-point scales (anchored at *disagree very much* and *agree very much*), and rated how “Confident” and “Self-Confident” they were using 9-point scales anchored at *not at all* and *very much*. These latter items were embedded in a series of irrelevant traits to conceal the focus on confidence. The four items were averaged to create a measure of trait self-confidence ($\alpha = .87$). These questions were meant to be very general and did not specify a referent for or origin of confidence.

In addition, participants completed 4 items assessing confidence in their thoughts and attitudes (e.g., “More often than not, I feel confident in my opinions.”), which were averaged to create a measure of judgmental confidence ($\alpha = .74$). These items were included to examine the

extent to which people's perceptions of their confidence in relevant domains related to the confidence in specific judgments in these domains (i.e., dispositional attitude confidence).

Self-esteem. Participants completed the 10-item Rosenberg Self-Esteem scale (RSE; Rosenberg, 1965), a global measure of one's self-evaluation. This scale includes items such as "I take a positive attitude toward myself" and "I certainly feel useless at times." Participants responded using a 6-point response scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). These items were averaged to create a single measure of self-esteem ($\alpha = .88$).

Self-esteem certainty. After indicating their self-esteem, participants completed a three-item measure of self-esteem certainty (for a review, see DeMarree, Petty, & Briñol, 2007). The items used in this study were: "How confident are you of your responses to the previous questions?", "How sure are you that your thoughts and feelings toward yourself are accurate?", and "How certain are you of your thoughts and feelings toward yourself?" These items were answered on 9-point scales ranging from 1 (*not at all confident/sure/certain*) to 9 (*extremely confident/sure/certain*). The items were highly inter-correlated and thus were combined to form an index of self-esteem certainty ($\alpha = .91$).

Judgmental self-doubt scale. The Judgmental Self-Doubt Scale (JSDS; Mirels et al., 2002) is a 19-item scale measuring doubt in individuals' judgmental ability. This scale predicts confidence in responses to a range of decision making paradigms (e.g., decisions in moral dilemmas, probability estimates), particularly when the decisions are difficult. It includes items such as "I often don't trust myself to make the right decision" and "In almost all situations I am confident of my ability to make the right choices" (reverse scored). JSDS scale items largely reflect confidence in one's ability to make good judgments, and as noted earlier, might be best construed as a measure of judgmental self-efficacy. Each item was answered on a 7-point scale

ranging from -3 (*strongly disagree*) to 3 (*strongly agree*). Responses to items were averaged to compute the scale ($\alpha = .93$).

Self-efficacy. Participants completed measures of general self-efficacy because we intuited that efficacy might be one construct that our participants are picturing when they think of “confidence” in a general sense. Three different scales were used (Bosscher & Smit, 1998; Chen, Gully, & Eden, 2001; Schwarzer, Mueller, & Greenglass, 1999). Some participants did not complete any of these scales ($n = 323$), some participants completed all three of these scales ($n = 230$), and the remaining participants completed one of the scales. Each scale attempted to assess people’s general perceptions regarding their capacity to succeed at any goal and to overcome obstacles to goal pursuit. To this end, scales asked participants to indicate their agreement with a series of relevant statements on 5-point scales (e.g., “I avoid trying to learn new things when they look too difficult.” “Failure just makes me try harder”). Note that general self-efficacy measures have been criticized as not measuring self-efficacy, which is typically conceptualized in a domain-specific manner (Bandura, 1997). Concerns have been raised that general self-efficacy measures may better serve as proxy measures of self-esteem (Bandura, 1997; Stanley & Murphy, 1997). Reliability of all scales was acceptable ($\alpha s = .82-.91$)

Narcissism. Some participants completed the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988). The NPI consists of 40 pairs of statements that participants must choose between, one of which is a narcissistic response (e.g., “I am no better or no worse than most people;” “I think I am a special person”). The proportion of narcissistic options selected was computed for each participant ($\alpha = .84$).

Need for cognition. All participants completed the 18-item version of the need for cognition scale (NFC; Cacioppo, Petty, & Kao, 1984). The NFC scale measures individual

differences in people's enjoyment of thinking (see Cacioppo, Petty, Feinstein, & Jarvis, 1996; Petty, Briñol, Loersch, & McCaslin, 2009). It includes items such as "I would prefer complex to simple problems" and "Thinking is not my idea of fun" (reverse scored). Each item is answered on a 5-point Likert scale ranging from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*). Items are recoded and averaged to create a single score for each participant ($\alpha = .86$).

Self-concept clarity. Some participants completed the self-concept clarity scale (Campbell et al., 1996) which measures the perceived clarity, certainty, and cohesiveness of people's self-conceptions. Participants indicated their agreement with 12 statements (e.g., "My beliefs about myself often conflict with one another") on a 7-point scale anchored at 1 (*strongly disagree*) and 7 (*strongly agree*). Participants' responses were recoded and averaged to form a composite ($\alpha = .88$).

Self-attributes questionnaire. Some participants completed a 5-item version of the self-attributes questionnaire (Pelham & Swann, 1989). On this, participants were asked to rate, on a 10-point percentile scale, their intellectual/academic abilities, social skills/social competence, artistic and/or musical ability, athletic ability, and physical attractiveness. These items were averaged to create an index of the positivity of people's self-conceptions (SAQ Val in Table 2; $\alpha = .64$). Following these initial ratings, participants' responses were presented back to them, one at a time, and they were asked to indicate their certainty in each response on a 10-point scale. These items were averaged to form one overall index of people's certainty in their self-conceptions (SAQ Cert in Table 2; $\alpha = .81$).

Results

For descriptive statistics and correlations among variables, see Table 2.

Table 2: Descriptive statistics and intercorrelations among Study 2 measures.

	<i>N</i>	<i>M</i>	<i>SD</i>	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A Attitudes	859	6.01	.87														
B Att Cert	859	7.36	1.08	.24													
C RSE	859	4.92	.87	.18	.18												
D Trait Conf	859	6.66	1.63	.15	.22	.72											
E Judge Conf	859	6.36	1.50	.11**	.27	.55	.70										
F JSDS	859	-.61	1.19	-.03 ^{ns}	-.24	-.53	-.60	-.65									
G SE Cert	859	7.88	1.27	.22	.34	.50	.49	.44	-.37								
H NPI	692	.44	.17	.13	.14	.39	.51	.41	-.37	.27							
I NFC	859	3.21	.63	-.09*	.16	.20	.25	.27	-.41	.12	.23						
J SCC	477	4.49	1.24	.10*	.21	.58	.56	.54	-.65	.40	.24	.14**					
K SAQ Val	445	6.56	1.20	.11*	.20	.41	.48	.41	-.36	.30	.46	.21	.30				
L SAQ Cert	445	7.92	1.52	.19	.27	.27	.35	.28	-.25	.40	.27	.11*	.23	.41			
M B Efficacy	230	4.06	.53	.01 ^{ns}	.26	.39	.44	.48	-.47	.38	.47	.35	.37	.45	.25		
N C Efficacy	321	4.20	.60	.11 ⁺	.18**	.51	.53	.44	-.51	.37	.38	.26	.42	.45	.30	.64	
O S Efficacy	445	3.84	.61	.11*	.27	.57	.53	.48	-.61	.37	.27	.51	.52	.33	.28	.56	.68

All $ps < .001$, unless otherwise indicated; ^{ns} $p > .10$, ⁺ $p < .10$, * $p < .05$, ** $p < .01$

Attitudes = average attitude score; Att Cert = average attitude certainty; RSE = Rosenberg (1965) self-esteem scale; Trait Conf = trait self-confidence, Judge Conf = judgmental confidence; JSDS = judgmental self-doubt scale; SE Cert = self-esteem certainty; NPI = narcissistic personality inventory; NFC = need for cognition; SCC = self-concept clarity; SAQ Val & SAQ Cert = self-attributes questionnaire valence and certainty; B, C, & S Efficacy are Boscher, Chen, and Schwarzer self-efficacy scales, respectively. Correlations between measures of confidence are in bold to ease identification.

Attitudes. We first sought to replicate prior research documenting individual differences in attitudes. To this end, we submitted the 10 responses to the attitudes questions to a maximum likelihood exploratory factor analysis. Inspection of the scree plot indicated a clear 1-factor solution accounting for 18.38% of the variance (Eigen values: 1.84, 1.16, 1.04, 1.01, .96, etc.). Factor loadings for this model were inadequate (5 of 10 items loaded below .3) and reliability was relatively poor ($\alpha = .45$). Nonetheless, this analysis replicates some prior support for the view that there are individual differences in the propensity to hold attitudes with a particular level of positivity versus negativity (Hepler & Albarracin, 2013; Judge et al., 2015).

Attitude certainty. As with the attitudes measure, we submitted the 10 responses to the attitude certainty questions to a maximum likelihood exploratory factor analysis. Inspection of the scree plot indicated that a 1-factor solution would best fit the data (Eigen values: 3.09, 1.09, .89, .87, .78, etc.). A 1-factor solution accounted for 30.88% of the variance. All items except one (affirmative action certainty, loading = .28) loaded greater than .40 on this factor. When these items were averaged into a scale of general attitude certainty, the reliability was relatively good ($\alpha = .72$) and superior to that observed in Study 1 which used only 4 attitude objects.

Relationships with other variables. To examine the extent to which dispositional attitude certainty is uniquely associated with the other confidence variables included in this study, we conducted a regression in which we predicted each of the other variables from the attitude and attitude certainty indices. As can be seen in Table 3, dispositional attitude certainty is either uniquely, or more strongly associated with several other measures of certainty than dispositional attitudes, including the trait certainty measure, JSDS, self-esteem certainty, self-concept clarity, and certainty in SAQ items. Dispositional attitude certainty was also more strongly associated with need for cognition, narcissism, and with various measures of self-

efficacy than was dispositional attitudes. Measures of self-efficacy might be a proxy for self-esteem or, like the JSDS, might represent people's beliefs that they can make good decisions, and as such, may form one important basis for holding attitudes and other judgments with certainty. One finding that was not expected was that average attitude certainty more strongly predicted the *positivity* of people's SAQ ratings (e.g., how attractive, artistic, or socially skilled people viewed themselves) than did average attitudes. In sum, whereas our first analyses demonstrated that the certainties in unrelated attitudes are related to each other (i.e., evidence for dispositional attitude certainty), our secondary analyses show that dispositional attitude certainty is related to a host of variables that make conceptual sense.

Table 3: Regression analyses, Study 2.

	Attitudes	Att Cer	RSE	Att Cert	B Efficacy	Att Cert
Attitudes	--	--	.14***	.22***	.04	.26***
RSE	.14***	.15***	--	--	.56***	.04
Trait Self Conf.	.11**	.19***	.71***	.09***	.51***	.07 ⁺
Judge Conf.	.04	.26***	.52***	.17***	.44***	.12**
JSDS	.03	-.24***	-.51***	-.14***	-.61***	-.01
SE Cert	.14***	.31***	.45***	.26***	.30***	.28***
NPI	.11**	.11**	.38***	.06 ⁺	.26***	.03
NFC	-.13***	.19***	.18***	.12***	.49***	.04
SCC	.05	.20***	.57***	.10**	.52***	<.01
SAQ Val	.06	.19***	.39***	.12**	.30***	.11*
SAQ Cert	.12**	.24***	.23***	.23***	.22***	.21***
B Efficacy	.04	.26***	.54***	.17***	--	--
C Efficacy	.07	.16**	.50***	.12*	.67***	.06
S Efficacy	-.06	.27***	.36***	.20***	.53***	.15**

⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. To facilitate comparison among predictors from the same model, entries are standardized betas.

Attitudes = average attitude score; Att Cert = average attitude certainty; RSE = Rosenberg (1965) self-esteem scale; Trait Self Conf. = trait self-confidence, Judge Conf = judgmental confidence; JSDS = judgmental self-doubt scale; SE Cert = self-esteem certainty; NPI = narcissistic personality inventory; NFC = need for cognition; SCC = self-concept clarity; SAQ Val & SAQ Cert = self-attributes questionnaire valence and certainty; B, C, & S Efficacy refer to the trait self-efficacy scales of Bosscher and Smit (1998), Chen et al. (2001), and Schwarzer et al. (1999), respectively.

Self-esteem and self-efficacy demonstrated modest relationships with dispositional attitude certainty. To be sure that the relationships with dispositional attitude certainty were not simply present due to their relationship with self-esteem or self-efficacy, we conducted regression models controlling for these potential confounding variables. Thus, we again predicted each of the other measures in this study from the average attitude certainty index, controlling for either the Rosenberg (1965) self-esteem scale or Bosscher and Smit's (1998) self-efficacy scale (the one administered to the most participants). As can be seen in Table 3, the relationship between attitude certainty and other forms of certainty generally remains even after controlling for self-esteem or self-efficacy, although these relationships are slightly weaker than in the initial analyses.

Discussion

Study 2 replicated past work documenting individual differences in attitudes and offered unique support for the existence of individual differences in attitude certainty. This study also examined the relationships between this construct and other forms of certainty. First, ratings of certainty in unrelated attitudes (e.g., in attitudes toward paper plates and George W. Bush) were related, forming a single factor and demonstrating stronger interrelationships than for unrelated attitudes.⁷ In addition, the current findings replicate those of Study 1 in demonstrating convergent validity in that individual differences in average attitude certainty are related to other certainty-related constructs, including not only certainty in other judgments, but also dispositions that may be related to the origins of certainty.

⁷ In the online supplement we explicitly provide a test of this hypothesis by comparing the average correlation among attitude questions against the average correlation among attitude certainty questions, finding strong support for it in every study.

As just noted, some of the individual differences associated with dispositional attitude certainty are potentially informative with regard to the origins of this disposition. For example, people who generally engage in a high amount of thinking (i.e., high need for cognition), a variable known to affect confidence (e.g., Barden & Petty, 2008), reported higher dispositional attitude certainty. Similarly, people who view themselves as competent in general (e.g., high self-esteem or general self-efficacy) or in forming judgments (low in judgmental self-doubt) reported higher dispositional attitude certainty. In addition, narcissism, a variable previously associated with chronic overconfidence (Campbell, Goodie, & Foster, 2004), was also related to dispositional attitude certainty. In short, the relationships observed in the present research are largely consistent with previous work on situational and individual difference influences on certainty and extend them to the disposition to hold one's attitudes with certainty.

Note also that the "trait self-confidence" measure we included in this study again demonstrated strong relationships with both self-esteem and self-efficacy, as did the closely-related judgmental confidence measure. This suggests that direct self-reports of confidence may represent self-esteem or self-efficacy more than they represent the tendency to form judgments with a particular level of certainty. Indeed, in our experiences talking with people about confidence, we've encountered a seemingly common lay understanding of "confidence" as referring to self-esteem or self-efficacy, and data like these are consistent with this observation. These measures were included in most of the remaining studies, but we relegate the description of these measures and any analyses involving them to the online supplement because they do not appear to capture the metacognitive certainty that is the focus of the present work.

Study 3

Our first two studies provided the first support for the existence of dispositional attitude certainty and showed that it is related to confidence in other judgments and variables that may be related to the origins of confidence. Study 3 sought to examine the predictive utility of individual differences in attitude certainty with respect to a new attitude object. Specifically, we examined whether a measure of dispositional attitude certainty would predict certainty in a *newly-formed* evaluation rather than just pre-existing opinions. Given the importance of attitude certainty in the research literature on attitudes (e.g., predicting resistance to change), being able to predict attitude certainty of a new object from measures collected prior to attitude formation would be a novel advance with potential real-world implications.

Method

Participants. Participants were 292 students at a large public university who participated in exchange for partial course credit. Participants were diverse with respect to gender (132 women, 158 men, 2 unreported), racial or ethnic identity (135 European/White, 101 Asian/Asian American, 17 Black/African American, 16 Hispanic/Latinx, 18 Mixed/other, 5 unreported), but not age ($M_{\text{age}} = 19.22$). Two participants did not complete all measures. The degrees of freedom in the analyses below reflect this. This sample size exceeds the estimated necessary sample size ($N = 172$) for a power of .95 given the median correlation between dispositional attitude certainty and other measures of certainty in the previous study ($r = .27$) and $\alpha = .05$.

Measures.

Dispositional attitudes and attitude certainty. In this study, we switched our measure of dispositional attitudes to one that has been empirically derived. Specifically, we used the full Dispositional Attitude Scale (DAS; Hepler & Albarracin, 2013). On the DAS, participants report their attitudes towards each of 16 different objects that vary in normative attitude (e.g., bicycles,

canoes, public speaking, receiving criticism) on a 7-point scale anchored at 1 (*extremely unfavorable*) and 7 (*extremely favorable*). To assess dispositional attitude certainty, participants were asked to report their certainty in each evaluation on a 7-point scale anchored at 1 (*not at all certain*) and 7 (*extremely certain*). For the sake of convenience, we've labeled this measure DAS-C to stand for Dispositional Attitude Scale with Certainty.⁸ We should note that although we use the DAS-C in the remainder of the studies, it is intended largely as a convenient tool for examining the conceptual questions regarding the dispositional nature of attitude confidence, and is not necessarily a "gold standard" measure of dispositional attitude confidence. Nonetheless, researchers using the DAS to assess individual differences in people's attitudes can easily and conveniently add a certainty item to each attitude question and thus have the DAS-C. We return to issues of measurement in the General Discussion, as this measure is likely not appropriate for all contexts.

Self-esteem. Participants completed the RSE as described in Study 2 ($\alpha = .91$).

Novel attitude and attitude certainty. In the development of the DAS, Hepler and Albarracín (2013) showed that dispositional attitudes generalized to the formation of new

⁸ An anonymous reviewer raised concerns that the disposition to be certain in one's attitudes might instead reflect a disposition to hold more extreme attitudes. Indeed, more extreme attitudes do tend to be held with more certainty and both attitude extremity and attitude certainty have been shown to predict the strength consequences of attitude durability and impactfulness (Bassili, 1996). However, past research on attitudes has found these dimensions to be related but distinct, both in terms of structural considerations (Krosnick et al., 1993) and relationships with various criteria (Bassili, 1996). In the current work, we created indices of dispositional attitude extremity using a parallel approach to the DAS and DAS-C indices used in this work. For each DAS item, we computed the extremity as the deviation from the neutral point of the scale, and then averaged these extremity ratings across all 16 DAS items. The resultant measure (DAS-E for extremity), serves as an indication of people's dispositional tendency to hold extreme attitudes (whether positive or negative in valence). We report analyses using this measure in the online supplement, but note here that it has only weak to moderate relationships with the DAS-C measure and key analyses using DAS-C to predict relevant criterion generally hold up when controlling for DAS-E (and DAS-E typically predicts in the opposite direction of DAS-C), suggesting that these constructs and measures are not redundant.

attitudes. That is, the more positive participants scored on the DAS, the more positively they rated a new attitude object. To examine whether dispositional attitude certainty showed a similar pattern of generalization to novel topics, we used materials from their Study 2.⁹ Specifically, participants read a description of a novel product (a microwave oven) and then received three positive and three negative reviews of the product. Next, they reported their attitudes toward the microwave using four 7-point semantic differential scales (*dislike-like*; *bad-good*; *useless-useful*; *unfavorable-favorable*; $\alpha = .89$). They also reported their attitude certainty using three 7-point scales (*certain, sure, confident*; $\alpha = .95$).

Results

For descriptive statistics and correlations among variables, see Table 4.

Table 4: Descriptive statistics and intercorrelations for Study 3 measures.

		M	SD	A	B	C	D
A	DAS	4.11	.67				
B	DAS-C	5.29	.93	.20**			
C	RSE	4.48	.90	.14*	.16**		
D	Novel Att	4.35	1.18	.12*	.02	.16**	
E	Novel Cert	4.09	1.67	.12*	.24***	.07	.20***

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

DAS = Dispositional Attitude Scale; DAS-C = certainty in responses to Dispositional Attitude Scale; RSE = Rosenberg (1965) self-esteem scale; Novel Att = attitude towards novel ambiguous product, Novel Cert = certainty in attitude towards novel ambiguous product.

Attitudes. We first attempted to conceptually replicate the results from Study 2. We submitted the 16 responses from the Dispositional Attitude Scale to a maximum likelihood exploratory factor analysis. Inspection of the scree plot did not indicate a clear solution, with 1- and 2-factor solutions appearing plausible (Eigen values: 2.75, 1.66, 1.31, 1.22, 1.14, 1.03, .97, 90, etc.). A 1-factor solution accounted for 17.16% of the variance, but some factor loadings for this model were inadequate (5 of 16 items loaded below .3) and reliability was modest ($\alpha = .65$).

⁹ We thank Justin Helper for providing these materials.

A 2-factor solution, with an equamax rotation revealed only a semi-interpretable factor structure. The first factor appears to represent attitudes towards outdoors activities (bicycles, camping, canoes) and the second factor was not clearly defined (highest loading items were statistics, playing chess, rugby, taxes).

Attitude certainty. We also submitted the 16 responses to the DAS-C to a maximum likelihood exploratory factor analysis. As in Study 2, this suggested that a 1-factor solution would best fit the data (Eigen values: 5.48, 1.37, 1.14, .95, .89, .79, etc.). A 1-factor solution accounted for 34.27% of the variance. All items except for one (architecture, loading = .26) loaded greater than .39 on this factor. When these items were averaged into a scale of dispositional attitude certainty (DAS-C), the reliability was good ($\alpha = .87$).

Relationships with a novel attitude and certainty. To examine the extent to which the DAS and DAS-C uniquely predicted the novel attitude and associated certainty, we regressed each of those criteria on both dispositional attitudes and dispositional attitude certainty. When predicting the novel attitude, we replicated Hepler and Albarracín (2013) in finding that dispositional attitudes (i.e., DAS) was a marginally significant predictor ($b = .21$, $SE = .11$, $\beta = .12$), $t(287) = 1.92$, $p = .056$, but dispositional attitude certainty (i.e., DAS-C) was not ($b = -.001$, $SE = .077$, $\beta = -.001$), $t(287) = .012$, $p = .99$. In contrast, when predicting *certainty* in the novel attitude, the DAS-C was a significant predictor ($b = .41$, $SE = .11$, $\beta = .23$), $t(287) = 3.90$, $p < .001$, but the DAS was not ($b = .19$, $SE = .15$, $\beta = .073$), $t(287) = 1.25$, $p = .21$.

Recall that in our previous studies, dispositional attitude certainty was significantly correlated with self-esteem, and this study was no exception (see Table 4). To determine whether the DAS-C predicted novel attitude certainty over self-esteem, we conducted regression analyses including both of these variables as predictors. The DAS-C continued to predict certainty in the

novel attitude over self-esteem ($b = .43$, $SE = .11$, $\beta = .24$), $t(287) = 4.09$, $p < .001$, whereas self-esteem did not ($p = .59$).

Discussion

Study 3 provides several novel advances over our previous studies. Notably, we used the items of the full DAS (Hepler & Albarracín, 2013) to assess dispositional attitudes and modified the measure to also assess dispositional attitude certainty (DAS-C). This measure provided strong support for our predictions regarding individual differences in attitude certainty, as a single factor emerged and produced a scale with acceptable reliability. Further, dispositional attitude certainty predicted certainty in a newly-formed attitude. Indeed, the DAS and DAS-C each uniquely positively predicted their corresponding measure (i.e., attitudes and attitude certainty, respectively) towards a novel object, providing a close replication of Hepler and Albarracín (2013; see also Eschelman et al., 2015), and extending their work to predicting certainty in a novel attitude. In Study 4, we seek to further explore dispositional attitude certainty by examining whether it predicts important attitudinally-relevant outcomes.

Study 4

Study 4 examined whether dispositional attitude certainty would predict the extent to which a person's *other* attitudes (i.e., those not included in the dispositional attitude certainty measure) predict attitude-relevant behavioral intentions. If the DAS-C predicts certainty in other (unrelated) attitudes as shown in Study 3, then the DAS-C could predict the extent to which the other attitudes guide behavior relevant to those attitudes. Predicting intentions and behavior are some of the most important effects in the attitudes literature, and one for which attitude certainty is a well-documented moderator (e.g., Kraus, 1995; Fazio & Zanna, 1978). If individual differences in certainty predict attitude-behavioral intention correspondence, it would suggest

researchers may be able to predict the likelihood that a person will act on their attitudes without knowing the certainty with which they hold that specific attitude (i.e., knowing only the certainty with which they hold other attitudes). In addition, we added the need for cognition scale, which is an individual difference variable associated with the extent of thought – one of the key antecedents of confidence – to determine whether the effects observed go beyond those captured by people’s typical amount of thinking and the most prominent individual difference that has been shown to moderate attitude-behavior consistency (Petty et al., 2009).

Method

Participants. Participants were 482 students at a large public university who participated for partial course credit. Participants were diverse with respect to gender (230 female, 252 male) and racial/ethnic identity (220 White/European, 121 Chinese, 40 Black/African America, 36 Korean, 33 Hispanic, 33 Asian Indian, 21 other Asian, 5 Filipino, 4 Japanese, 4 Hawaiian/Pacific Islander, 3 Vietnamese, 2 American Indian, participants were allowed to select multiple categories), but not age ($M_{\text{age}} = 19.51$). After completing the consent process, participants completed measures of attitudes and attitude certainty as well as trait self-confidence in counterbalanced order. They then completed behavioral intention items. After a brief pilot study for another line of research, participants completed the need for cognition and self-efficacy scales. Power in multilevel modeling is difficult to estimate. We initially ran 294 participants, a similar number to Study 3, and all of the Confidence x Attitude interaction effects were significant except for the effect of trait self-confidence controlling for self-efficacy ($p = .18$, see online supplement for analyses involving this measure), so we then attempted to collect as many additional participants as we could before the end of the academic term (additional $n = 188$). This did not change the significance of any of the results (including the one non-significant

result, which ended up at $p = .21$). However, using the p-augmented approach (Sagarin, Ambler, & Lee, 2014), we adjust our critical p-value to .0318 to maintain the intended alpha of .05.

Measures.

Dispositional attitudes and attitude certainty. In this study, we again used the Dispositional Attitude Scale (DAS; Hepler & Albarracin, 2013) as well as certainty in each item (i.e., DAS-C), as described in Study 3. In addition, we added items assessing attitudes towards drinking coffee, eating meat, playing video games, and shopping at Walmart, which combined with the DAS item of “playing chess” served as the attitude measures for which we assessed relevant behavioral criterion. Because playing chess was one of the behavioral criteria, this item and its associated certainty were not included in the DAS and DAS-C indices for any analyses predicting behavioral intentions. Note that the same results hold if this item is kept in the indices of dispositional attitude certainty or is dropped as one of the behavioral criteria.

Need for cognition. Participants completed the 18-item Need for Cognition scale (Cacioppo et al., 1984) as described in Study 2 ($\alpha = .82$).

Self-efficacy. Participants completed the General Self-Efficacy scale (Chen et al., 2001), also used in Study 2. This scale presents participants with a series of statements reflecting people’s general ability to achieve their goals (e.g., “In general, I think that I can obtain outcomes that are important to me.”; “Even when things are tough, I can perform quite well.”). Participants indicated the extent to which each statement was characteristic of them on a 5-point scale (*extremely uncharacteristic* to *extremely characteristic*; $\alpha = .90$).

Behavioral Intentions. For three of the issues (playing chess, playing video games, shopping at Walmart), we used likelihood questions (e.g., In the next month, how likely is it that you will play a game of chess?). These were presented as 7-point scales anchored at *extremely*

unlikely and *extremely likely*. For the other two topics (eating meat and drinking coffee) we used scales assessing frequency per week with anchors that our previous work suggested captured a meaningful range of these behaviors (e.g., for drinking coffee, the lowest scale value was 0 servings, and each subsequent scale value representing a range of the next 5 servings (1-5, 6-10, etc.), for eating meat, the values increased by 4 servings (1-4, 5-8, etc.). Specific behavioral intention criteria were selected based on pilot data that identified topics and corresponding behavioral intentions for which there was a significant and moderate to strong (i.e., $r_s > .30$) relationship in this population.

Results

For descriptive statistics and intercorrelations among measures included in this study, see Table 5.

Table 5: Study 4 correlations and descriptive statistics.

		<i>M</i>	<i>SD</i>	A	B	C
A	DAS	4.14	.69			
B	DAS-C	5.09	1.02	.29		
C	Efficacy	4.06	.64	.20	.25	
D	NFC	3.28	.55	.37	.22	.39

Note: for correlations, all $ps < .001$

DAS = Dispositional attitudes scale; DAS-C = certainty in DAS items. Correlations are with full 16-items from DAS/DAS-C (i.e., with “playing chess” included). This item was excluded in analyses involving the behavioral intentions criteria. Additional correlations are available in the online supplement.

Dispositional attitudes. We first attempted to replicate the results from Studies 2 and 3. We submitted the 16 responses to the DAS to a maximum likelihood exploratory factor analysis. Inspection of the scree plot was congruent with a 1-factor solution, although a 3-factor solution also appeared plausible (Eigen values: 3.01, 1.52, 1.31, 1.08, .99, .95, .93, etc.). A 1-factor solution accounted for 18.80% of the variance, but factor loadings for this model were inadequate (4 of 16 items loaded below .3) and reliability was modest ($\alpha = .70$ for all 16-items; α

= .67 for the 15-items excluding playing chess, because playing chess was one of the behavioral intentions examined). A 3-factor solution, with an equamax rotation revealed only a semi-interpretable factor structure. The first factor appeared to represent attitudes toward outdoor activities, as the only items loading above .3 were canoes, camping, and bicycles. The highest loading items on the second factor were playing chess, architecture, and statistics, while the highest loading items on the third factor were public speaking and politics.

Dispositional attitude certainty. As with attitudes, we submitted the 16 DAS-C questions to a maximum likelihood exploratory factor analysis, which again suggested that a 1-factor solution would best fit the data (Eigen values: 6.05, 1.10, .96, .88, etc.). A 1-factor solution accounted for 37.81% of the variance. All items loaded greater than .42 on this factor. When these items were averaged into the DAS-C, the reliability was good ($\alpha = .89$; $\alpha = .88$ for the 15-items excluding playing chess).

Attitude-behavior intention correspondence. For the behavioral intention analyses, we had relevant variables (i.e., attitudes, behavioral intentions, attitude-certainty) for 5 different attitude objects. As noted in the methods section, however, several of these measures had slightly different behavioral metrics (e.g., natural frequency versus likelihood ratings) and the variability of individual behaviors was inconsistent across topics (see Table S5 in the online supplement). Because of this, each dependent measure was standardized to put them all on the same metric. Then, data were restructured and analyzed using multilevel modeling, with each observation nested within the specific attitude object and within person. This approach maximizes power by allowing each participant to contribute 5 observations to a single analysis (2410 total observations) while still considering the non-independence of observations from a given participant and any given behavioral criterion (Judd, Westfall, & Kenny, 2012). In order to

provide standardized slope estimates (Snijders & Bosker, 2011) and to ensure that all predictors were on the same metric, all predictors and outcomes were standardized (i.e., to create a grand mean of 0 and a standard deviation of 1). Across attitude objects, the intercept was allowed to vary, and across participants the intercept and slope of attitudes were allowed to vary.

Conclusions do not change if these model parameters are changed (i.e., which effects are treated as random versus fixed). Interactions were probed and plotted using the recommendations and online tools of Preacher, Curran, and Bauer (2006).

For the first analysis, we sought to determine whether certainty in the relevant attitude moderated attitude-behavioral intention correspondence. This analysis is not informative with respect to the study goals regarding individual differences in confidence, but does test whether we replicate past findings of attitude certainty moderating relevant attitude-behavior intention correspondence. To do this, we predicted behavioral intentions from attitude, attitude certainty, and the Attitude x Attitude Certainty interaction. As seen in Table 6, this model revealed significant main effects of attitude, $t(554) = 24.81, p < .001$, and attitude certainty $t(2222) = 3.79, p < .001$. These patterns were such that more positive attitudes and higher levels of certainty were associated with increased intentions to engage in the behaviors. Most critically, the Attitude x Attitude Certainty interaction was also significant $t(1348) = 6.14, p < .001$. As can be seen in Figure 1 (left panel), this interaction was such that attitudes were stronger predictors of relevant behavioral intentions for people high in attitude certainty ($b = .63, SE = .023, t(554) = 26.79, p < .001$, compared with people low in certainty ($b = .42, SE = .030, t(554) = 13.79, p < .001$). These analyses replicate the classic moderating role of attitude certainty on relevant attitude-behavior correspondence (e.g., Kraus, 1995).

Next, we sought to determine whether dispositional attitude certainty moderated the same attitude-behavioral intention correspondence. To do this, we predicted behavioral intentions from attitudes, DAS-C (omitting the playing chess item), and the Attitude x DAS-C interaction. As seen in Table 6, there was a significant main effect of attitude, $t(437) = 28.98, p < .001$, along with the predicted the Attitude x DAS-C interaction, $t(320) = 4.18, p < .001$. As can be seen in Figure 1 (right panel), this interaction was such that attitudes were stronger predictors of behavioral intentions for people high in dispositional attitude certainty ($b = .62, SE = .024$), $t(320) = 25.65, p < .001$, compared with people low in dispositional attitude certainty ($b = .48, SE = .027$), $t(320) = 17.92, p < .001$. This is consistent with the idea that dispositional attitude certainty (i.e., certainty in attitudes *unrelated* to the specific behavioral criterion) can be used to predict unrelated attitude-behavioral intention correspondence.

Table 6: Multilevel models predicting behavioral intentions in Study 4.

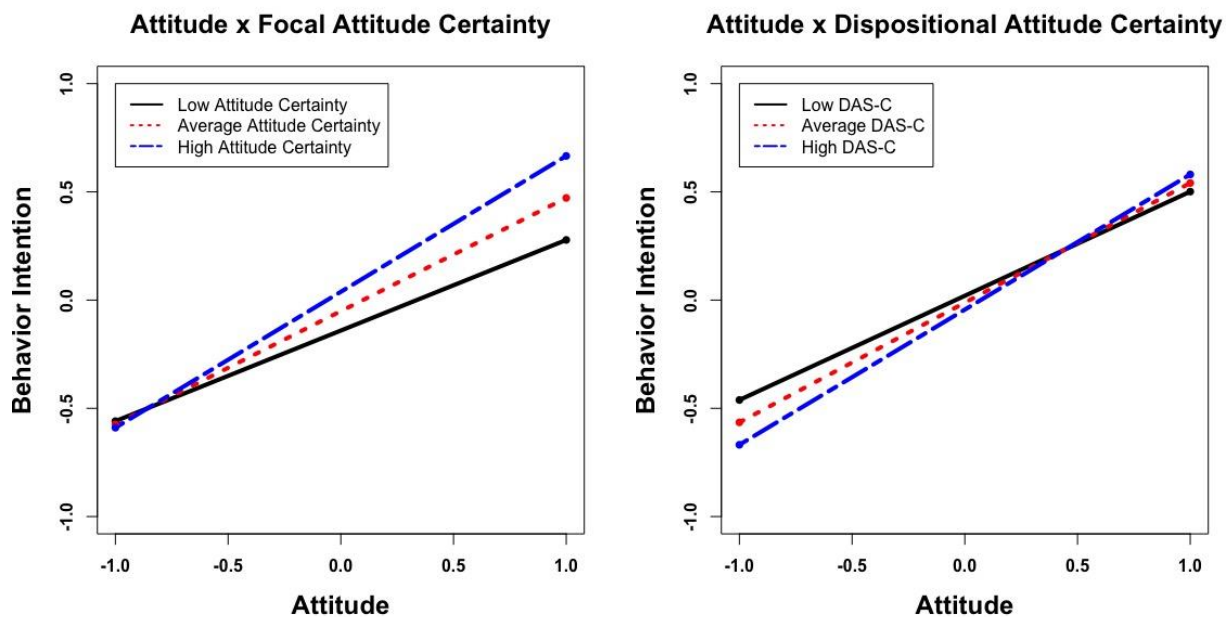
	Focal Attitude Certainty			DAS-C		
Fixed Effects						
Intercept	-.05 (.10)	-.05 (.10)	-.049 (.10)	-.01 (.10)	-.01 (.10)	-.01 (.09)
Attitude	.52 (.02)***	.52 (.02)***	.52 (.02)***	.55 (.02)***	.55 (.02)***	.55 (.02)***
Cert	.09 (.02)***	.09 (.02)***	.09 (.02)***	-.03 (.02)	-.04 (.02)	-.04 (.02)+
Attitude x Cert	.10 (.02)***	.10 (.02)***	.10 (.02)***	.07 (.02)**	.06 (.02)***	.06 (.02)***
Efficacy		-.005 (.02)			.01 (.02)	
Attitude x Efficacy		.05 (.02)**			.04 (.02)+	
NCOG			.02 (.02)			.03 (.02)
Attitude x NCOG			.05 (.02)**			.05 (.02)**
Variance/Covariance Parameters						
Residual	.58 (.02)***	.58 (.02)***	.58 (.02)***	.58 (.02)***	.59 (.02)***	.58 (.02)***
Intercept (participant)	.11 (.02)***	.11 (.02)***	.11 (.02)***	.10 (.02)***	.10 (.02)***	.10 (.02)***
Attitude slope (participant)	.02 (.01)*	.02 (.01)+	.02 (.01)+	.02 (.01)*	.02 (.01)*	.02 (.01)+
Int/Att cov (participant)	.04 (.01)***	.03 (.01)***	.03 (.01)***	.04 (.01)***	.04 (.01)***	.04 (.01)***
Intercept (object)	.05 (.04)	.05 (.04)	.05 (.04)	.04 (.03)	.04 (.03)	.04 (.03)

Study 4 multilevel models predicting behavioral intentions from predictors specified in each column. "Cert" refers to the specific measure of certainty referred to in each column. DAS-C is the certainty in items from the dispositional attitude scale. Fixed effects can be interpreted as standardized betas, as predictors and criterion were standardized prior to analysis.

* $p < .10$, ** $p < .0318$, *** $p < .001$

For each of the analyses just reported, we also conducted ancillary analyses controlling for self-efficacy and its interaction with attitude or with need for cognition and its interaction with attitude (see Table 6). Adding these additional predictors did not change the conclusions drawn from the primary analyses reported above. Further, there was a consistent tendency for need for cognition to predict attitude-behavioral intention correspondence. In addition, the online supplement reports additional analyses with trait self-confidence and judgmental confidence as predictors, finding that general measures of certainty also predicted attitude-behavioral intention correspondence in this study.

Figure 1: Attitudes predicting behavioral intention, as moderated by each indicator of confidence (Study 4).



Note: DAS-C = Dispositional attitude certainty (i.e., confidence in responses to Dispositional Attitude Scale, excluding any items included in behavioral criterion).

Discussion

Study 4 showed that individual differences in attitude confidence can moderate one of the most important effects in the attitude literature: attitude-behavioral intention correspondence. Specifically, dispositional attitude certainty, as indicated by the DAS-C, moderated the

relationship between unrelated attitudes and behavioral intentions across a set of five different attitude objects and their unique behavioral criterion. These effects held up after controlling for general self-efficacy or need for cognition, both of which also predicted attitude-behavior correspondence (the NFC finding replicates past work on attitude strength; e.g., Barden & Petty, 2008; Petty et al., 1995).

Study 5

So far, we have provided evidence that there are correlations among ratings of certainty in relatively unrelated attitudes and that when these certainty ratings are aggregated (e.g., as in the DAS-C), they can be used to predict certainty in newly-formed attitudes (Study 3) and correspondence between unrelated attitudes and behavioral intentions (Study 4). However, the previous studies have limitations. Most critically, thus far all of our studies have examined dispositional attitude certainty at a single point in time. If dispositional attitude certainty truly is a trait, then it should be relatively stable over time. Further, although the measures of dispositional attitude certainty used thus far have been able to predict relevant outcomes, these findings potentially could be obtained without positing a stable disposition. Because relatively transient experiences, such as one's current mood (Briñol et al., 2007) or feelings of power (Durso et al., 2016), can affect confidence, results obtained from a single time point could reflect the influence of relatively transient variables that affect all measures of certainty similarly, rather than stable individual differences.¹⁰ In Study 5, we assessed dispositional attitude certainty at two points in time in order to examine the extent to which the general attitude confidence we've observed thus far is actually a stable dispositional tendency towards having confidence in one's

¹⁰ We thank André Mata for raising this issue.

attitudes. Further, we attempted to predict relevant outcomes at a later time point from dispositional attitude certainty measured weeks earlier.

Another concern is that it is yet unclear whether the dispositional attitude certainty we've examined thus far is specific to *attitudes*. In each of our previous studies, the dispositional attitude certainty items are related to other measures of confidence, but not so strongly that they appear to measure the exact same thing. However, the way we've measured dispositional attitude certainty is through assessing certainty in a range of specific attitudinal judgments (e.g., the items from the DAS), which is not parallel to the other measures of confidence with which we've examined relationships. These other measures of confidence used different scale anchors and response formats, and also tended to be more general in nature, either because they asked for confidence in more general judgments (e.g., self-reported confidence in judgments or confidence in participants' responses to the RSE scale), or because they asked for general perceptions of confidence without a specific judgmental referent (trait self-confidence). The apparent independence of these different certainty measures could be due, at least in part, to differences in the assessment methods of these concepts. To further explore the distinctions among these confidence related concepts, in the present studies, we examined participants' certainty in a range of domains using nearly identical certainty items to those we used to measure dispositional attitude certainty. This should reduce these other potential sources of variability and allow us to explore the extent to which certainty in one's attitudes is similar to or distinct from certainty in other domains.

Finally, in Study 4, we examined the correspondence between attitudes and behavioral intentions. This is an important contribution. However, attitudes researchers are often interested in predicting actual behavior, not just intentions to behave. Although we were unable to examine

overt behavior in vivo given the resources available, in Study 5, we did measure participants' *reports* of their recent behavior rather than their future intentions. In doing so, we asked participants to report behavior frequencies in an open-ended manner, so that the response scales did not constrain or influence their responses. Retrospective reports of behavior, although not perfect, tend to be well-correlated with overt behavior (e.g., Johns & Miraglia, 2015; Kormos & Gifford, 2014; Patrick et al., 1994), particularly for behaviors that are more readily observable (Gosling, John, Craik, & Robins, 1998) or occur relatively regularly (Schwarz, 2007).

We accomplish these goals using two independent samples that completed the same measures, with slight variations between samples, as noted below. These samples were both pre-registered (RM: <https://aspredicted.org/blind.php?x=zr2uj9>; SS: <http://aspredicted.org/blind.php?x=vc5bm7>).

Method

Participants. As noted earlier, power in multilevel modeling is difficult to estimate, but given the success of Study 4 (which used 482 participants) and the plan to use a similar research design with even more observations per person in this study, we targeted 500 participants in each sample. We preregistered this target as well as an end-date for data collection for each sample. For the ResearchMatch sample, we slightly exceeded the target sample size, but for the student sample we fell slightly short of it by the targeted end date.

ResearchMatch Sample (RM). Participants were recruited through ResearchMatch, a service designed to aid in participant recruitment for a variety of clinical and translational research, with a database of over 140,000 volunteers. RM participants were adults in the United States who participated in exchange for a drawing for gift cards for an online retailer. An initial posting on the service generated a list of interested participants who were invited to participate.

Of those invited, 711 completed the initial baseline study (i.e., T1). Any participant who completed this initial phase and who provided permission to be contacted for a follow up study was emailed approximately 2-3 weeks after their initial participation to complete the follow-up study (T2). In total, 551 participants completed both phases of the study. On average, participants completed the second session 18.16 days after they completed the prescreening ($SD = 2.53$, range 11-28).

Participants in this sample who completed both waves of data collection were diverse with respect to gender (395 female, 146 male, 9 other/non-binary, 1 unreported) and age ($M_{age} = 48.29$, $SD = 17.62$). The sample was majority White/European ($n = 513$), with smaller numbers of other racial/ethnic groups (19 Black/African American, 13 Hispanic, 7 American Indian, 6 Asian Indian, 6 Japanese, 5 Chinese, 4 Korean, 4 other Asian, 2 Pacific Islander, 1 Filipino, 1 Vietnamese, participants were allowed to select multiple categories).

Student Sample. Participants in the student sample were 444 undergraduate students at a large public university who participated for partial course credit. Included in the psychology department's mass survey was a set of questions asking participants to report their attitudes and associated certainty towards a series of items relevant to this study (i.e., the DAS, DAS-C, and attitude/certainty items related to behavioral criteria). Although most participants completed this measure early in the term, participants could do so at any point during the semester in question. Subsequently, any participant who completed the prescreening measures was eligible to participate in the laboratory study (T2). This occurred on average 40.91 days after they completed the prescreening ($SD = 19.83$, range 0-69 days).

Participants in this sample who completed both waves of data collection were diverse with respect to gender (181 female, 257 male, 2 other/non-binary, 4 unreported) and racial/ethnic

identity (250 White, 73 Chinese, 67 Black/African American, 41 Hispanic, 19 Asian Indian, 18 Korean, 14 other Asian, 5 Filipino, 4 Vietnamese, 4 American Indian, 3 Hawaiian/Pacific Islander, participants were allowed to select multiple categories, 4 participants did not respond to any demographic questions), but not age ($M_{\text{age}} = 19.51$).

Procedure and Procedural Variations. Participants indicated their consent prior to each phase of data collection. All participants completed the DAS/DAS-C as well as attitudes and associated certainty towards different topics related to behavioral criteria at both time points. All participants completed the behavioral criteria first during the second session. In addition, all participants completed a series of other potentially related measures, including their certainty in other judgment domains (general knowledge and perceptual judgments), trait self-confidence, need for cognition, self-esteem, and self-concept clarity. For the RM sample, all of these measures were completed in the first session, whereas for the student sample, all of these measures were completed in the second session. See the Study 5 flow chart in the supplemental methods and results document (Figure S2) for a visual depiction of these variations.

Measures.

Dispositional attitudes and attitude certainty. In this study, we again used the Dispositional Attitude Scale (DAS; Hepler & Albarracín, 2013, $\alpha_{\text{SS-T1}} = .77$, $\alpha_{\text{SS-T2}} = .65$, $\alpha_{\text{RM-T1}} = .72$, $\alpha_{\text{RM-T2}} = .74$) and certainty in these items (DAS-C, $\alpha_{\text{SS-T1}} = .91$, $\alpha_{\text{SS-T2}} = .87$, $\alpha_{\text{RM-T1}} = .90$, $\alpha_{\text{RM-T2}} = .91$), as described in Study 3. In addition, we added items assessing attitudes as well as their associated certainty towards flossing, shopping at Walmart, playing video games, drinking water, drinking coffee, eating meat, exercise, drinking soda, and eating junk food, which combined with the DAS item of “playing chess” served as the focal attitude measures for which we also assessed relevant behavioral reports. Because playing chess was one of the potential behavioral

criteria, this item and its associated confidence were excluded from the DAS/DAS-C indices in any analyses for which attitudes or reported behavior related to “playing chess” were involved as specific predictors or criteria (relevant to student sample only, see below).

Behavioral Reports. Participants were asked to recall and report their behavioral frequencies over a set period of time (e.g., “in the last week/month”) regarding 10 attitude objects described in the previous section. The 10 behavioral criterion items were selected based on a pilot study using a student sample ($N = 128$). Participants in the pilot study indicated their attitudes as well as associated behavioral intentions (using the same open-ended format as this study) towards a broad range of attitude objects. Attitude items that predicted the corresponding behavioral intentions with an $r > .30$ were selected for the present study. The pilot study questions were worded as behavioral intention items (e.g., “In the next week, how many days do you intend to exercise/workout?”), but were modified to assess recent *past* behavior in the current study (e.g., “In the past week, on how many days did you exercise/work out?”). To minimize the influences of the scale format on people’s responses, participants reported all behavioral frequencies in an open-ended format, where they manually typed numbers to indicate the frequencies of their behaviors.

In our pre-registration, we specified that we would examine the distribution of each of the behavioral reports and would “cap” them at reasonable values for each sample based on the distribution of responses to avoid an excessively skewed distribution (e.g., in the student sample, we capped the number of servings of coffee consumed in the previous week at 14, recoding the 8 participants who indicated weekly coffee consumption greater than this to 14). We also pre-registered that we would only retain for analysis those attitude-behavior pairs that had a zero-order correlation between T1 attitude and T2 behavior of at least .25. The rationale was that it

did not make sense to examine moderation of a relationship that was not present to begin with. For each sample, nine of the ten items passed this threshold (see supplemental materials, Table S8). “Playing chess” failed to meet this criterion in the RM sample and “drinking water” failed to meet this criterion in the student sample, and thus these were not included as criteria in their respective samples. Because “playing chess” was an item from the DAS, analyses predicting reported behavior that used average certainty in DAS items (i.e., DAS-C) as a predictor used a variation of the DAS-C that excluded this item for the student sample. Note that we present descriptive statistics, correlations, and analyses that do not involve specific focal attitude issues using the original 16-item version of the DAS/DAS-C, though using the reduced item set (or an expanded item set including all attitudes assessed, even those involving behavioral criteria), does not change the conclusions.

Certainty in Judgments in Other Domains. To assess certainty in other judgmental domains that are not attitudes, we adapted materials that have been used to examine predictors of confidence judgments. Specifically, we adapted materials that Koriat (2008; 2011) has used in tests of his self-consistency model of confidence (Koriat, 2012).¹¹ We used materials from two different judgmental domains, general knowledge and perceptual judgments. In each of the paradigms we adapted, participants make a forced-choice judgment between two alternatives and then indicate their certainty in that judgment. Whereas Koriat (2008; 2011) had participants indicate their certainty by indicating the probability that their chosen answer was correct, we modified the questions to directly mirror the attitude certainty questions for comparison

¹¹ This model explains the sources of confidence of individual judgments (i.e., not trait-levels of confidence). It notes that information considered during the judgmental process, such as the consistency and ease with which information related to a particular response is generated influence people’s confidence in that particular judgment.

purposes, using the same scale and scale anchors and very similar wording of the question stem (only changing the judgmental referent) as the attitude certainty questions.

General Knowledge Certainty. The general knowledge questions were adapted from Koriat (2008). Participants answered 18 forced-choice questions assessing their factual knowledge (e.g., “Which Austrian researcher discovered the laws of genetics?” options provided were Mendel or Einstein in random order). After indicating their answer and on the same screen, for each question participants also indicated their certainty in their choice using the same response scale as the attitude certainty measure with anchors of 1 (*not at all certain*) and 7 (*extremely certain*) ($\alpha_{SS-T2} = .86$, $\alpha_{RM-T1} = .86$).

Perceptual Judgement Certainty. The perceptual judgment questions were also adapted from Koriat (2011). Participants were given 16 pairs of (non-straight) lines and were asked to choose the line that was perceived to be longer. After indicating their answer, for each question, participants also reported their certainty in each judgment using the same response scale as the attitude certainty measure with anchors of 1 (*not at all certain*) and 7 (*extremely certain*) ($\alpha_{SS-T2} = .96$, $\alpha_{RM-T1} = .97$).

Additional Measures. Participants also completed the 18-item Need for Cognition scale (Cacioppo et al., 1984; $\alpha_{SS-T2} = .82$, $\alpha_{RM-T1} = .89$), the 10-item Rosenberg (1965) self-esteem scale ($\alpha_{SS-T2} = .91$, $\alpha_{RM-T1} = .93$), as well as the 12-item self-concept clarity scale (Campbell et al., 1996; $\alpha_{SS-T2} = .90$, $\alpha_{RM-T1} = .91$), each as described in Study 2. Note that analyses involving these measures are presented in the online supplement, though we summarize them briefly below.

Results

For descriptive statistics and intercorrelations among measures included in these studies, see Table 7. We present the results below organized by analysis, and present results for both data sets within each section.

Structure of attitudes and attitude certainty. First, to examine the uniqueness of dispositional attitude certainty, we examined the correlational structure of attitudes, attitude certainty, and certainty across judgments using factor analysis and comparisons of correlations, the latter of which are reported in the online supplement. We begin with analyses parallel to our earlier studies, then move on to analyses that included the certainty items in other domains. Note that some measures were included at multiple time points. To simplify presentation, we describe only those results from whichever session contained the most measures (T1 for the RM sample, T2 for the student sample), but conclusions do not change if the other timepoint is used instead.

Table 7: Study 5 correlations and descriptive statistics.

		M_{SS}	SD_{SS}	M_{RM}	SD_{RM}	A	B	C	D	E	F	G	H	I
A	DAS (T1)	3.90	.80	4.29	.71	-	.21***	.71***	.05	.21***	.08 [†]	.34***	.07	.04
B	DAS-C (T1)	5.16	1.14	5.78	.87	.26***	-	.03	.55***	.07	.04	.11*	.13**	.13**
C	DAS (T2)	4.18	.68	4.23	.72	.81***	.21***	-	.06	.21***	.08 [†]	.36***	.04	.01
D	DAS-C (T2)	5.47	.93	5.92	.82	.12**	.60***	.12**	-	.06	.14**	.06	.10*	.08 [†]
E	GK Cert	3.46	1.03	4.29	1.02	.29***	.16***	.27***	.12**	-	.41***	.15**	.02	-.08 [†]
F	Perc Cert	4.45	1.30	3.95	1.39	.02	.23***	.04	.20***	.26***	-	-.02	.05	-.08
G	NFC	3.18	.51	3.52	.66	.33***	.14***	.30***	.08 [†]	.22***	.03	-	.17***	.20***
H	RSE	4.32	.92	4.48	1.06	.17***	.14***	.15***	.18***	.14**	.10*	.23***	-	.65***
I	SCC	4.30	1.23	4.84	1.18	.16***	.17***	.12**	.23***	.17***	.08 [†]	.28***	.69***	-

Note: Values below the diagonal are from the RM sample whereas values above the diagonal are from the student sample. DAS = Dispositional attitudes scale (original 16-item scale); DAS-C = certainty in the same DAS items. For the student sample (SS), the general knowledge confidence (GK Cert) and the perceptual judgment confidence (Perc Cert) were collected at time 2 (T2), whereas for the Research Match sample (RM), the same measures were collected at time 1 (T1). For the student sample, all correlations using 15-item DAS/DAS-C (i.e., without “playing chess”) were within $r = .02$ of those presented here.

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Dispositional attitudes. We first examined dispositional attitudes (DAS) using exploratory factor analysis. For the RM sample, inspection of the scree plot was most congruent with a 1-factor solution (Eigen values: 3.30, 1.46, 1.26, 1.10, 1.03, .94, .92, .87, etc.). A 1-factor solution accounted for 20.60% of the variance, but not all factor loadings for this model were strong (4 of 16 items loaded below .3) and reliability was modest ($\alpha = .72$). For the student sample, inspection of the scree plot was most congruent with a 2-factor solution, although a 1-factor solution also appeared plausible (Eigen values: 2.91, 1.45, 1.16, 1.11, 1.04, .98, .93, .89, .82, etc.). A 1-factor solution accounted for 18.17% of the variance, but factor loadings for this model were inadequate (6 of 16 items loaded below .3) and reliability was modest ($\alpha = .68$ for the full 16-item scale). The second factor of the 2-factor solution did not have a clear interpretation, as the highest loading items were canoes and architecture.

Dispositional attitude certainty. As with attitudes, we submitted the 16 responses to the attitude certainty questions (DAS-C) to a maximum likelihood exploratory factor analysis. For the RM sample, inspection of the scree plot was most congruent with a 1-factor solution (Eigen values: 6.36, .97, .85, .81, .78, etc.). A 1-factor solution accounted for 39.73% of the variance. All items loaded above .50 on this factor and reliability was good ($\alpha = .90$). For the student sample, inspection of the scree plot also revealed a clear one-factor solution (Eigen values: 7.16, 1.15, .93, .84, .71, etc.) that accounted for 44.75% of the variance. All items loaded above .45 on this factor and reliability was good ($\alpha = .88$ for the full 16-item scale). Therefore, across two samples, a one-factor solution appears to be most adequate for the observed attitude certainty data, consistent with our earlier studies.

Structure of certainty across domains. New to this study, we had a series of certainty judgments in response to a range of specific judgments that were non-attitudinal. To examine the

structure of these judgments, we submitted participants' certainty in their responses to the DAS items (DAS-C, 16 certainty judgments), general knowledge questions (18 certainty judgments), and perceptual judgment (16 certainty judgments) to a maximum likelihood exploratory factor analysis, with equamax rotation.

For the RM sample, the scree plot revealed a 3 or 4-factor solution (Eigen values: 12.70, 5.90, 4.74, 1.69, 1.12, 1.06, .99, .94, .90, .87, etc.). For the 4-factor solution, the first factor represented certainty in perceptual judgments, as all perceptual certainty items loaded at least .76 on this factor and no other item loaded greater than .23 on it. The second factor represented attitude certainty, as all attitude certainty items loaded at least .51 on this factor and no other item loaded greater than .15 on it. The third and fourth factors represented certainty in participants' responses to general knowledge questions. No clear pattern emerged from these loadings, and some items had loadings on both factors and some did not strongly load on either factor.

For the student sample, the scree plot revealed a clear 4-factor solution (Eigen values: 11.81, 5.63, 3.99, 2.04, 1.21, 1.08, 1.05, 1.01, .94, .92, .92, .88, etc.). The first factor again represented certainty in perceptual judgments, as all perceptual certainty items loaded at least .68 on this factor and no other item loaded greater than .19 on it. The second factor again represented attitude certainty, as all attitude certainty items loaded at least .44 on this factor and no other item loaded greater than .15 on it. The third and fourth factors represented certainty in participants' responses to general knowledge questions. As in the RM sample, no clear pattern emerged from these loadings, and some items loaded on both factors. Therefore, across both samples, certainty in attitudes appear to be distinct from certainty in other judgment domains.

Stability of certainty. To examine stability of attitude certainty over time, we examined the bivariate correlations between measures of certainty (and related measures) collected at two time points. For the RM sample the correlational stability across the two time points, which averaged 18 days apart, was $r = .81$ for DAS and $r = .60$ for DAS-C ($ps < .001$). For the student sample the correlational stability across the two time points, which averaged 41 days apart, was $r = .71$ for DAS and $r = .55$ for DAS-C, ($ps < .001$). Thus, across both data sets, dispositional attitude certainty, like dispositional attitudes, appears to be stable across the timespans examined.

Prediction of certainty over time. In response to a reviewer's comments, we also examined a different way to examine the utility of the dispositional attitude certainty construct: prospective prediction of certainty in other attitudes. This addresses the question of whether knowing a person's responses to the DAS-C at one point in time allows for the prediction of certainty in other (unrelated) attitudes at a later point in time. To examine this question, we used DAS-C to predict subsequent certainty in the individual focal attitudes using multilevel modeling, allowing the certainty judgments to vary randomly across issue and participant. To obtain standardized betas, standardized predictors and criterion were used in analyses. In both samples, DAS-C measures at T1 significantly predicted certainty in the focal issues at T2 (RM: $b = .283$, $SE = .0219$, $t(548) = 12.922$, $p < .001$; Student: $b = .307$, $SE = .0239$, $t(442) = 12.860$, $p < .001$).

Attitude-reported behavior correspondence. Each behavioral report was an open-ended frequency measure. The survey automatically restricted responses with natural limits (e.g., if a question asked on how many days in the past week a behavior was enacted, it was capped at 7) and we capped others based on the distribution of responses in each sample, which reflected meaningful differences in the frequency with which some behaviors were reported (e.g., mean

coffee consumption of 8.28 cups per week in the RM sample versus 3.05 cups per week in the student sample). The cutoffs were employed to reduce long tails of the distributions by capping them at values exceeded only by a few isolated responses (e.g., number of servings of coffee in the past week was capped at 35 in the RM sample but at 14 in the student sample, with values above these caps recoded to the cap [each cap changed fewer than 2% of responses]). This was done to reduce the skew of the distribution and to decrease the influence of outliers. Consistent with Study 4 and with our pre-registration, we then standardized each behavioral report prior to restructuring for multilevel analysis. The analytical approach mirrored that of Study 4, except that each person contributed 9 observations. Again, observations were nested within participants and attitude object. Intercepts were allowed to vary across attitude objects and participants, and the slope of attitudes was allowed to vary across participants. As with Study 4, predictor variables were standardized prior to analysis to increased comparability of betas within an analysis and to obtain standardized betas. Conclusions do not change if these model parameters are changed (i.e., which effects are treated as random versus fixed). Interactions were probed and plotted using the recommendations and online tools of Preacher et al. (2006). Note that because the DV was not normally distributed, we also re-ran the focal models using Bayesian estimation in MPlus, which does not impose normality assumptions, and the conclusions of each analysis were consistent with the results reported here.

Focal attitude certainty. For the first analysis, we sought to determine whether certainty in the focal attitude at (T1) moderated the extent to which the T1 attitude predicted the T2 behavior report. As with Study 4, this analysis is not informative with respect to the study goals regarding individual differences in confidence, but does test whether we replicated past findings (including our Study 4) of attitude certainty moderating attitude-behavior correspondence. To do

this, we predicted the T2 behavior report from the T1 attitude, attitude certainty, and the Attitude x Attitude Certainty interaction.

As seen in the first two columns of Table 8, in both data sets, this model revealed a significant main effect of attitudes and the Attitude x Attitude Certainty interaction. Both patterns were such that attitudes were more predictive of associated behavior reports as participants were more confident in these specific attitudes (see the top left panel of Figure 2 for the graph of this effect in the student sample, and top right panel for the RM sample). These analyses replicate the classic moderating role of attitude certainty on attitude-behavior correspondence (e.g., Kraus, 1995).

Table 8: Multilevel models predicting reported behavior in Study 5.

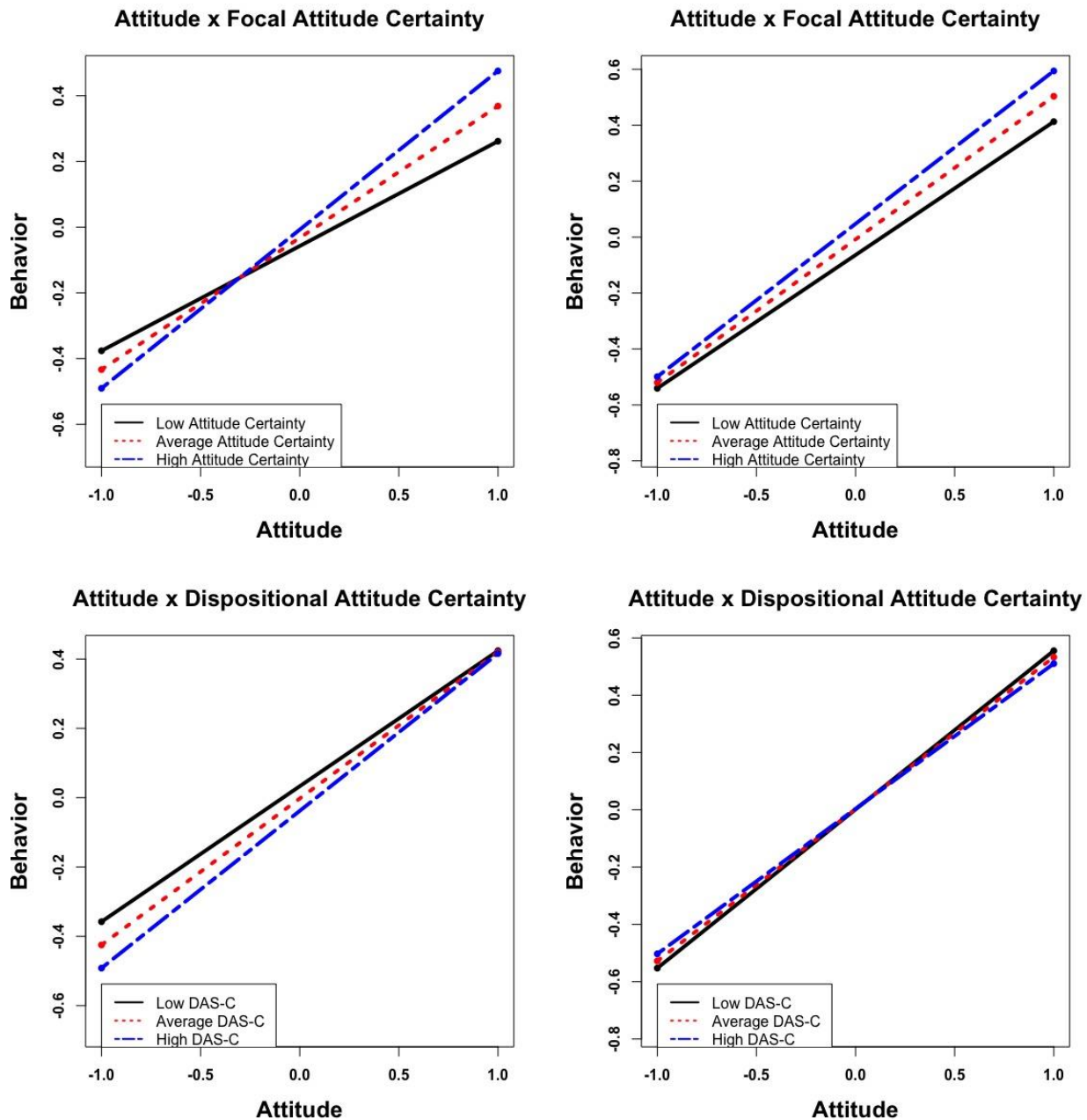
	Focal Attitude Certainty		DAS-C	
	RM	SS	RM	SS
Fixed Effects				
Intercept	-.01 (.10)	-.03 (.06)	.002 (.09)	-.003 (.06)
Attitude	.51 (.02)***	.40 (.02)***	.53 (.01)***	.42 (.02)***
Cert	.06 (.02)***	.02 (.02)	.001 (.01)	-.04 (.02)*
Attitude x Cert	.03 (.01)*	.08 (.02)***	-.02 (.01)+	.03 (.02)*
Variance/Covariance Parameters				
Residual	.77 (.02)***	.80 (.02)***	.77 (.02)***	.81 (.02)***
Intercept (participant)	.02 (.01)*	.03 (.01)***	.02 (.01)*	.03 (.01)**
Attitude slope (participant)	.01 (.01)	.01 (.01)+	.01 (.01)	.01 (.01)+
Intercept (object)	.08 (.04)+	.03 (.02)+	.08 (.04)+	.03 (.02)+

Study 5 multilevel models predicting reported behavior from predictors specified in each row. Entries are unstandardized betas and associated standard errors. "Cert" in a row refers to the specific measure of attitude certainty indicated in the corresponding column. RM = ResearchMatch sample, SS = Student sample.

Note: Models did not converge when random slopes and random intercepts were allowed to covary. These models were then re-run without this parameter included to eliminate this estimation problem.

+ $p < .10$ * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2: Attitudes predicting reported behavior, as moderated by each focal attitude confidence (top) and dispositional attitude confidence (bottom) (Study 5, Student Sample plotted on left, RM sample on right).



Note: DAS-C = Dispositional attitude certainty (i.e., confidence in responses to Dispositional Attitude Scale, excluding any items included in behavioral criterion).

Dispositional attitude certainty. Next, we sought to determine whether dispositional attitude certainty (as indicated by the DAS-C) at T1 moderated the correspondence between attitudes and reported behavior (i.e., between attitudes reported at T1 and behavior reported at

T2) for attitude objects not included in the DAS-C. We used the same basic model as above, except we replaced the certainty in the focal attitude with the dispositional measure of attitude certainty, the DAS-C. As seen in Table 8, the two samples demonstrated different effects. In the student sample, dispositional attitude certainty significantly moderated the relationship between attitudes and behavioral reports in the predicted direction, such that people who were more certain of their attitudes in general showed stronger attitude-reported behavior correspondence (see Figure 2, bottom left panel). However, in the RM sample (Figure 2, bottom right panel), there was a marginal tendency for DAS-C scores to predict a weaker attitude-reported behavior relationship, which is a non-significant trend opposite to what we predicted. We return to this inconsistency in the discussion.

Supplemental analyses. We also conducted a series of supplemental analyses, examining the primary effects controlling for each of the other measures included in these data sets, including other measures of certainty and the trait measures of need for cognition, self-esteem, and self-concept clarity. The data sets are not perfectly equivalent, as the RM sample had these measures included at T1, whereas the student sample had these measures included at T2, after participants reported their behavior. For analyses parallel to the DAS-C (T1) analyses reported in the paper, controlling for any of the individual trait (self-esteem, need for cognition, self-concept clarity) or certainty (e.g., perceptual certainty, judgmental certainty) measures, results remain largely unchanged, with the T1 DAS-C predicting stronger attitude-reported behavior correspondence in the student sample and weaker attitude-reported behavior correspondence in the RM sample. If we use the T2 DAS-C in the student sample, it is directionally consistent with the T1 analyses, but did not approach significance. Several of the other measures also predicted increased attitude-reported behavior correspondence in both data sets, including need for

cognition, self-esteem, self-concept clarity, as well as general knowledge certainty. See the online supplemental materials for the full description of these results.¹²

Discussion

Study 5 examined a number of questions related to the dispositional nature of individual differences in attitude certainty, finding strong support for some questions, but mixed or weak support for others. First, we examined whether dispositional attitude certainty was related to the tendency to be certain in other judgments. Using certainty scales that were very similarly worded and used the same response scales for attitudes, answers to general knowledge questions, and perceptual judgments, we found that certainty in each type of judgment formed separate factors. Further, scales made from the certainty of each of these types of judgments were only modestly related to each other, consistent with the idea that they're measuring different things. Second, we examined whether the construct we've labeled dispositional attitude certainty actually represents a stable disposition. We found relatively strong correlations across the time periods examined in both data sets, averaging 18 and 41 days, with correlations of .60 and .55, respectively. These findings were consistent across both the student and on-line samples. Finally, we examined whether dispositional attitude certainty could predict the correspondence between attitudes and subsequently reported behavior. Here we obtained mixed support, with only one data set supporting the prediction.

This latter point was the only one in which there was substantive disagreement across data sets, so it is worth considering potential reasons for this inconsistency. One possibility is that the effect is not particularly robust. This could be the case if the Study 4 effect examining

¹² In addition to the pre-registered analyses just described, we also conducted a series of exploratory analyses reported in the online supplement. These showed that focal attitude certainty could also predict the stability of attitudes over time. Dispositional attitude certainty predicted stability of other attitudes in the student sample, but not in the RM sample.

parallel effects on behavioral intentions was a fluke or because dispositional certainty predicts the extent to which attitudes predict behavioral *intentions*, but not reports of recent behavior. Another possibility is methodological in that the behavioral criteria were pretested on the student sample, the one obtaining supportive results, and not the on-line RM sample. Perhaps if we had selected behavioral criteria based on pretesting in a RM sample instead, the opposite pattern would have emerged.

However, it may also be that the inconsistencies between the student and RM data sets are informative with regard to the psychological processes at play. The samples differ in a number of important ways, but most notably in terms of their age and stage of life. The student sample may still be in the process of exploring their independence from their parents, and as such, their unique behavioral repertoires and attitudes may both be emerging (Sears, 1986). In contrast, the older adults in the RM sample may have much better-established patterns in their lives, including habitual responses and external constraints on their behavior (e.g., work and family). These differences could have several implications for the inconsistency across samples. Among college students, the certainty with which they hold their attitudes may be more likely due to dispositional factors rather than topic-specific factors that might arise over the course of a lifetime of experience (e.g., direct experience with the behaviors, an accumulation of topic relevant knowledge, etc.). The behavioral reports of college students may also be less likely than older adults to be situationally constrained and less habitually determined, leading college students to be more likely to consult with their attitudes when deciding how to behave. In order for one's certainty in an attitude to be influential, the attitude itself has to be considered to begin with. For older adults whose behaviors are more likely to be more habitual or may be constrained by a more structured life, their behavioral choices may no longer require the consideration of

their attitudes, at least for the sorts of relatively high frequency behaviors examined in this study. These possibilities are speculative, so it would be interesting to repeat our research using behaviors that are less constrained in a non-student sample. We return to these issues in the General Discussion.

General Discussion

Although several prior studies have documented individual differences in the propensity to hold overall attitudes (e.g., Hepler & Albarracín, 2013; Judge, 1993; Judge et al., 1998), no prior work had investigated the possibility that there are also individual differences in the second most studied feature of attitudes – the certainty with which these attitudes are held. Thus, across five studies, we examined individual differences in attitude certainty and its relation to other types of certainty and certainty outcomes. It is notable that prior studies of attitude certainty have either used manipulations of certainty or measured certainty-relevant beliefs and applied these to certainty in particular attitudes. The current research is the first to show that certainty in an attitude is generally related to one's certainty in other attitudes, reflecting a dispositional attitude certainty. Further, this dispositional attitude certainty appears to be relatively stable over time, related to but distinct from other attitude-relevant dispositions and from other dispositions to be certain. The documentation of this disposition and its correlational validity and stability was consistent across student (Studies 2-5) and non-student (Studies 1 and 5) samples.

This work did more than merely document the existence of dispositional attitude certainty, however. We showed that dispositional attitude certainty can predict certainty in newly formed evaluations (Study 3) and can predict the extent to which attitudes predict behavioral intentions (Study 4) or reports of recent behavior (Study 5, student sample only). Next, we place this work in the broader context of work on certainty and on attitudes and persuasion, describe

potential implications of these findings as well as discuss some of the strengths and weaknesses of the current work.

One Certainty or Many Certainties

In the introduction we noted that past work had documented individual differences in confidence in other domains. Much like the current research, this prior work found that even though a series of judgments might be unrelated to each other, the confidence in these judgments was related (Jackson & Kleitman, 2014; Kleitman & Stankov, 2007). This raises important questions about whether dispositional attitude certainty is merely a reflection of a general tendency to be confident of anything. In our studies, the measures of dispositional attitude certainty were consistently correlated with measures of other dispositions to be confident. The magnitude of these correlations was quite variable, however, including some larger correlations, but was not of the magnitude that one would expect between two measures of the same construct. However, differences in how the concepts were measured could have attenuated the correlations. For example, in Study 2, in addition to the measure of dispositional attitude certainty employed (certainty in 10 different attitudes), we assessed certainty in responses to the Rosenberg Self-Esteem (RSE) scale and the Self-Attributes Questionnaire (SAQ). The self-esteem certainty questions were asked after participants had completed all 10 RSE items, which is not at all parallel to the pairwise assessment of each attitude and its associated certainty. The SAQ certainty items each referred to the specific SAQ item participants had completed, which was similar to the dispositional attitude assessment. However, all SAQ ability ratings occurred first, and the subsequent certainty questions specifically included participants' responses to the earlier question.

This is why our Study 5 used measures of certainty in a variety of judgments that were parallel to our assessments of dispositional attitude certainty. The factor analysis of these items suggested that dispositional attitude certainty was distinct from certainty in perceptual judgments and certainty in general knowledge questions. Further, even though assessed in such similar ways, the scales made from these items were only weakly correlated with each other (correlations between DAS-C and the other measures of certainty were $< .20$ in both samples). Thus, at least when using this approach, the evidence suggests that dispositional attitude certainty is related to but different than certainty in other judgments. This is itself a novel finding, as no work we're aware of that has examined individual differences in any confidence judgment has also examined the generality versus specificity of the individual difference. Future work examining the antecedents and correlates of certainty could examine which ones predict certainty across judgmental domains and which only predict certainty in individual domains, though we speculate on some potential factors later.

Assessment of Dispositional Attitude Certainty

Although the current studies offer compelling initial insight into the existence of individual differences in attitude certainty and their relevance for understanding attitude strength, they also raise additional questions. One important question is how best to assess individual differences in attitude certainty. Given the findings described in the previous section, that dispositional attitude certainty appears to be distinct from other forms of confidence, we do not recommend using non-attitudinal certainty to predict attitude-relevant outcomes, as the non-attitudinal measures of certainty tended to be weaker predictors of the attitude effects across studies. In the current work, we typically assessed dispositional attitude certainty using the DAS-C. However, as noted when introducing this measure, we used this approach because the DAS

(Hepler & Albarracín, 2013) was a pre-existing, empirically-validated measure of dispositional attitudes that could be easily modified for our purposes. One key strength of this measure is that the attitudes contained within it are ones that people generally do not have strong attitudes towards. For the purposes of assessing dispositional attitudes and for assessing dispositional attitude certainty, this is a strength of the measure, as the measure allows dispositions to manifest more easily. If the measure contained topics with which people had very strong attitudes (e.g., legal access to abortion), topic-specific factors might overwhelm the influence of dispositions.

However, the DAS is likely limited in its relevance and interpretation across cultures, largely because it was developed in a North American cultural context. For example, the DAS contains an item assessing attitudes towards “soccer.” The specific term used to describe this sport varies considerably across culture and language. Furthermore, although in the United States people may not typically have strong attitudes towards soccer, in many other countries in the world, people frequently have very favorable and very strong attitudes toward the sport. Thus, this item may not afford the opportunity for a person’s disposition to exert its influence either on the attitude or attitude certainty ratings. A similar analysis could likely be made for other items on the DAS, as the literal and cultural meaning of each term could vary in consequential ways across countries. That said, although the specific measure might be improved upon for use in different cultures, the *measurement approach* may still be quite valid. If such an approach is used in a different cultural context, we would recommend using an approach similar to the development of the DAS, where a large pool of candidate items are used and narrowed down based on their factor loadings and coverage of normative attitude within the target population (for more details on DAS development, see Hepler & Albarracín, 2013). Nevertheless, it may

still be the case that the DAS and DAS-C overall could prove useful in a variety of contexts, even if individual items on the DAS may lack cross-cultural validity.

Origins of Trait Confidence

In the introduction we noted that the certainty with which a person holds a given attitude has many antecedents. Indeed, the multitude of attitude-relevant processes that impact attitude certainty may be why certainty has been such a successfully-studied variable – it captures the culmination of multiple psychological variables that are relevant to the strength of an attitude (thinking, accessibility, experience; Fazio & Zanna, 1978b; Petty et al., 2007). The certainty with which a person holds a given attitude is thus the product of a variety of processes that affected that attitude to that moment, including those related to the attitude's creation (e.g., amount or balance of thought), retrieval (e.g., ease of retrieval or ease of construction), and those that might be completely incidental to the attitude formation process (e.g., a person's mood).

Consequently, when we think about the origins or effects of dispositional attitude certainty, it is worth noting that we do not think of dispositional attitude certainty as a psychological latent concept that is itself a coherent underlying factor. Rather, it is more likely to be an individual tendency that is the product of multiple dispositions and psychological processes such as those described below. Consequently, when we refer to dispositional attitude certainty or its impact, we are really referring to the effects of the collection of relevant factors that produced the overall tendency to form and hold attitudes with a particular degree of certainty versus doubt. We should note that the factors we describe below likely affect confidence across a wide range of judgments, so we describe each in turn, but at the end of this section return to distinguishing dispositional attitude certainty from other dispositional confidence.

So, what are the relevant factors that could produce individual differences in attitude certainty? There are likely many ways that such individual differences come about. As observed in Study 1, dispositional attitude certainty was positively related to extraversion and negatively related to neuroticism. These traits have been consistently linked to positive and negative affect, respectively (Costa & McCrae, 1980; Watson & Clark, 1992). Critically, general positive affect has been linked to increased confidence, and negative affect to decreased confidence (Briñol et al., 2007; Huntsinger, 2012). However, these generic affective traits likely do not tell the whole story, as confidence appraisals of specific emotions do not perfectly track positivity, with some positive emotions reflecting relatively low confidence (e.g., awe) and some negative emotions reflecting relatively high confidence (e.g., anger; Petty & Briñol, 2015; Smith & Ellsworth, 1985), especially when the cognitive rather than affective appraisals of these emotions are salient (Briñol et al., 2018).

In addition, self-esteem appears to be modestly, but consistently related to dispositional attitude certainty. People who evaluate themselves favorably may experience positive affect more often, but may also be particularly likely to *trust* their own thoughts and feelings, compared with people who evaluate themselves negatively (Harber, 2005). High self-esteem people might be more likely to view their own attitudes, thoughts, and feelings as credible, and consequently end up more certain in their attitudes, judgments, and other mental contents. Notably, however, supplemental analyses in our studies showed that dispositional attitude certainty generally predicted attitude consequences above and beyond self-esteem.

Epistemic sources of dispositional attitude certainty are also likely. Notably, we observed that measures of attitude certainty were positively associated with the individual difference measure *need for cognition* (Cacioppo et al., 1984). Past work has shown that increased thought

about an attitude object – either situationally induced or due to a person’s disposition – is associated with increased attitude certainty (Barden & Petty, 2008). Because need for cognition should predict increased thought across most of a person’s attitudes, it is quite reasonable to predict that people high in this disposition will be certain in a wide range of attitudes, resulting in increased levels of dispositional attitude certainty. Individual differences in confidence are not limited to individual differences in need for cognition, of course, as suggested by Study 4’s finding that trait measures of confidence and of need for cognition independently predicted attitude-behavioral intention correspondence. In addition, a person’s own history of forming attitudes that appear to be valid, either by producing the desired outcomes or by being shared by one’s social network, could lead one to trust one’s thought processes. This might be consistent with correlations of measures of confidence with measures of self-efficacy, though as noted earlier, general measures of self-efficacy might be better seen as proxy measures of self-esteem (Bandura, 1997; Stanley & Murphy, 1997).

In addition, motivational factors are also likely to play a role. People often project their goals onto their judgments (Dunning, Leuenberger, & Sherman, 1995; Serra & DeMarree, 2016; Willard & Gramzow, 2009), and the goal to hold one’s beliefs with confidence is thought to pervade social and non-social judgment (Chaiken, Liberman, & Eagly, 1989; Festinger, 1954; McGregor, Zanna, Holmes, & Spencer, 2001). When people’s confidence is undermined, they often reclaim confidence in unrelated domains (McGregor et al., 2001). So, if there are dispositional differences in the tendency to (internally) experience uncertainty or to respond to uncertainty or other threats (Jonas et al., 2014) in a defensive manner, this could, in part, produce individual differences in attitude confidence. One possible predictor is narcissism and in particular, its vulnerable form (e.g., Bosson et al., 2008). Trait measures of narcissism predict the

related construct of overconfidence (Campbell et al., 2004). Further, narcissism seems to predict the reliance on people's current mental states in much the same way that confidence does (Finkel, Campbell, Buffardi, Kumashiro, & Rusbult, 2009). This idea is bolstered by the positive relationship between narcissism and measures of confidence observed in Study 2.

In contrast to narcissism, people who are high in intellectual humility may report more doubt (i.e., lower levels of attitude confidence). Intellectual humility is the belief that one's judgments are fallible, and may be based on insufficient information or reasoning (e.g., Leary, 2017), and though typically examined as a disposition, has also been examined in specific judgments (Hoyle et al., 2016). People high in intellectual humility report more *uncertainty* in at least some judgments and show other behaviors consistent with judgmental uncertainty (e.g., increased thought about novel information; Leary et al., 2017). However, given that intellectual humility and dispositional attitude certainty have different patterns of relationships with other variables (e.g., more humility is associated with higher need for cognition but more uncertainty is associated with lower need for cognition), it is clear that these variables likely meaningfully differ.

Social factors may also affect people's disposition to be confident. Notably, social consensus is a common, and powerful determinant of attitude certainty, with greater certainty experienced when people perceive greater consensus (e.g., Petrocelli et al., 2007; Visser & Mirabile, 2004). For people who have relatively homogenous (versus heterogenous) social networks, they may find that nearly all of their attitudes are supported when expressed, leading them to believe that their attitudes or attitude formation processes are valid. Indeed, social network homogeneity has been found to increase attitude strength outcomes like resistance to

change as well as people's reports of their attitude certainty (Levitan & Visser, 2009; Visser & Mirabile, 2004).

We should note that many of the above sources of certainty are ones that may predict outcomes across numerous judgmental domains. For example, positive affect and need for cognition should impact people's certainty in their attitudes as well as in nearly any other judgment they make. However, results from the current studies suggest that although certainty judgments across domains are modestly related, they appear to be distinct. There are several possibilities that may explain this apparent inconsistency. One is that there are at least some antecedents of dispositional attitude certainty that are presumably distinct from the antecedents of certainty in other domains. For example, a person's need to evaluate (i.e., their motivation to form and hold attitudes; Jarvis & Petty, 1996) is likely relatively specific to attitudes and may impact attitude certainty, but may not affect certainty in other domains (e.g., factual knowledge). Similarly, domain-specific beliefs likely contribute to one's certainty (e.g., if someone believe they're capable of making visual judgments, then they're likely to use these general beliefs to inform certainty across all their perceptual judgments but not their attitudinal judgments; see Ehrlinger & Dunning, 2003).

Another possibility is that some of the antecedents of certainty may have differing amounts of impact across domains, creating differences in the disposition to be confident across domains. Attitudes in particular do not have an objective standard against which to assess their validity, whereas other types of judgments (e.g., factual judgments examined in Studies 1 and 5) do. Certainty in attitudes may be based more on subjective perceptions of validity rather than perceptions regarding the objective validity of a judgment because for attitudes, objective standards for validity are not available. This may lead attitude certainty to be more greatly

influenced by affective traits, stable social factors, and so forth, compared with more objective judgments. This is congruent with social comparison theory (Festinger, 1954; Hypothesis II) which long ago argued that people would prefer objective standards when evaluating a belief, ability, or attitude, and would turn to comparisons with others when such standards were not available. Again, the differential operation of relevant processes across domains would produce differences in dispositional attitude certainty compared with dispositional certainty in other domains.

Impact of Dispositional Attitude Certainty

One innovation of the present research is that it introduces a novel method to potentially predict, *a priori*, who is more likely to rely on their attitudes for guiding behavior or to have relatively stable newly formed or changed attitudes – even before these attitudes are developed. This is important because it provides new proxy measures for attitude strength that are unrelated to the attitude *per se*. From this point of view, the present research introduces new indirect ways to predict attitude strength outcomes. However, the data that support this implication were mixed, with the two student samples (Study 4 & 5) finding support for it (using both behavioral intentions and reports of recent behavior) but the non-student sample in Study 5 failing to support it. Although it is possible that this inconsistency reflects natural variability in the magnitude of the effect, it is worth considering whether this may lend insights into the mechanism by which dispositional attitude certainty exerts its impact. We first discuss potential mechanisms before relating them back to the inconsistent findings found in Study 5. Crucially, we believe that understanding these mechanisms may inform the conditions under which dispositional attitude certainty will be a useful predictor of relevant outcomes and when it will

not be. This discussion is necessarily speculative, though we hope it will stimulate research to better understand these processes.

There are two somewhat related questions to consider regarding mechanisms. The first question is when will one's general dispositional attitude certainty predict the certainty with which someone holds a specific attitude? The second question is when will dispositional attitude certainty predict the strength consequences of a particular attitude (e.g., attitude-behavior correspondence, resistance to change, etc.). This latter issue is more downstream than the former issue, so a broader range of relevant factors will likely be relevant.

To the first question, we believe that there are a few key factors to consider when determining how a person's general disposition to hold attitudes with certainty will predict their certainty in a specific attitude. Most contemporary accounts of metacognition hold that certainty judgments are at least partly constructed based on the cues and experiences available as relevant information is retrieved from memory (e.g., Koriat, 2012). This includes informational factors like the amount and consistency of knowledge retrieved, as well as experiential factors like the ease with which it is retrieved, and so forth (Rucker et al., 2014). In the context of dispositional attitude certainty, many of the dispositional factors that would affect attitude formation, such as a person's propensity to think carefully in general or to form attitudes specifically, would also affect the informational and experiential cues available when people encounter the attitude object. From this perspective, the construction of specific attitude certainty would be relatively bottom-up, and the disposition would be due to individual differences in the cues available for construction. However, top-down processes are also possible. For example, these construction processes might be shaped or constrained by people's pre-existing beliefs about how their minds work or by people's general beliefs regarding their judgmental abilities, confidence, or

opinionatedness. Such effects might be analogous to the ways in which general self-beliefs guide people's specific performance estimates (Ehrlinger & Dunning, 2003), including the possibility that general beliefs might bias interpretation of the available lower-order cues (e.g., by biasing interpretation of retrieval fluency; Critcher & Dunning, 2009). Another potential top-down influence is that a person's general sense of certainty or any confidence-laden experiential mindsets (e.g., chronic anger or positive affect versus chronic fear or negative affect) might be mis-attributed to any salient mental experience (Briñol & Petty, 2009; Clore & Parrott, 1994), including an attitude one is currently considering.

With these potential mechanisms in mind, we can make several predictions about the conditions under which the general disposition to hold one's attitudes with certainty will predict a person's confidence in a specific attitude. Critically, the factors available for constructing one's object-specific certainty will be a combination of those that reflect or result from a person's general disposition (e.g., to be thoughtful, to be confident, to readily form opinions, etc.) and those that are specific to the attitude object. Some topic specific factors will necessarily reflect the person's disposition (e.g., if they think carefully in general, thinking carefully about a policy proposal will produce many policy-relevant thoughts that affect attitude formation), but some will deviate in meaningful ways from a person's typical (dispositional) responses to any given attitude object. This could include factors like the amount of direct experience with the attitude object, the evaluative consistency of attitude-relevant knowledge, as well as factors like the extent to which a given attitude is relevant to a core identity, value, or ideology. To the extent that the available factors are topic-specific, the impact of a person's general disposition to hold attitudes with certainty or doubt will decrease. In other words, when topic-specific factors are

strong and salient, they may overshadow the impact of people's dispositional tendencies on topic-specific confidence.

The second question to consider is how dispositional attitude certainty translates into the potential downstream consequences of an attitude, such as attitude-behavior consistency. First, not all behavior is determined by one's attitudes. Some behaviors are constrained by factors outside of one's personal control (Ajzen & Fishbein, 2000) or are enacted habitually (Wood & Neal, 2007), and in these cases, one's attitude may not be considered when initiating behavior. If one's attitude itself is not considered, then the certainty with which it is held is unlikely to matter in predicting behavior. Further, certainty itself is metacognitive in nature, and considering the certainty with which a particular attitude is held is likely a relatively thoughtful process (Briñol & Petty, 2009; Petty et al., 2007), so attitude certainty should matter the most when people are being relatively deliberative about how to behave. This is not to say that certainty cannot matter in lower thought situations. Based on the work of Koriath (2012), people may only consider a few cues when constructing their confidence, and if these cues are consistent in their implications, a certainty judgment may be accessed quickly. Further, some of the factors that produce certainty could potentially affect behavior in ways that are not mediated by certainty itself. For example, forming an attitude through careful thinking will typically produce an attitude that is held with certainty, but it will often also produce an attitude with a relatively clear memory trace that may efficiently guide behavior, even if the level of certainty is not considered. At the "top-down" level, a general sense of confidence might lead people to be more likely to act on their attitudes and other inclinations, even if this does not go through the process of carefully considering the certainty in a particular attitude.

So, to return to the earlier point regarding the inconsistency across samples in Study 5. Dispositional attitude certainty predicted correspondence between attitudes and reported behavior in the student sample, but not in the older (average age of 48) ResearchMatch sample. As mentioned in the discussion of that study, compared with the college student sample, the behavior that RM participants' reports were based on may be more constrained by contextual and habitual factors that may characterize their stage of life. These constraints would decrease the likelihood that their attitudes (and/or attitude certainty) would be consulted when enacting the types of behaviors examined in that study (i.e., those that we thought would have meaningful variability across a 1-week time span). Also, with additional time and experience beyond the emerging adulthood period of our college student sample, each of the focal attitudes would have the opportunity to be associated with a richer array of topic-specific cognitive, affective, and behavioral information, which has the potential to reduce the impact of more general antecedents of certainty. This is not to say that similar processes or their effects would not operate in an older sample. Rather, the topics we used (e.g., drinking coffee, eating meat, shopping at Walmart) may be ones that are not as appropriate for testing our hypotheses in an older population, and instead, topics for which people have less clearly-developed attitudes and habits may still demonstrate similar effects to those observed in the student samples. This is necessarily conjecture, and future research should investigate these possibilities.

Limitations and conclusions

The present studies offer initial support for the existence and utility of dispositional attitude certainty. We documented this dispositional attitude certainty initially in a large and very diverse sample (Study 1) and in subsequent studies showed how this dispositional certainty was related to important attitudinal outcomes (such as predicting behavior). However, these studies

are not without their limitations. For one, the results were not perfectly consistent across all analyses and all studies. Most notably, correspondence between attitudes and behavioral reports was predicted well in the student samples (Studies 4 and 5), but not in the ResearchMatch sample (Study 5). In addition, as noted in the discussion above, the specific operationalization of dispositional attitude certainty that we used, the DAS-C, may not be optimal for use outside of a U.S. cultural context. Furthermore, we used self-reports of behavioral intentions (Study 4) or reports of recent behavior (Study 5) rather than measuring *in vivo* overt behavior.

Supplemental analyses in Study 1 demonstrated that there may be meaningful variability in dispositional attitude certainty across different demographic variables, such as race, religion, gender, education, and income. For example, higher levels of dispositional attitude certainty were associated with reports of having higher income, being married rather than single, and being Christian rather than atheist or agnostic (see online supplement). People from different groups may vary in their life experiences, different learning histories, ideologies, and social interactions, all of which have the potential to produce meaningful differences in their attitude certainty. In addition, cultural factors might lead people from some cultures to rely on different bases of confidence (e.g., Gelfand, Spurlock, Snizek, & Shao, 2000), such as one's own thoughts and thought processes in an analytic or individualistic culture versus social information in a holistic or collectivistic culture.

However, differences in mean levels of certainty do not necessarily mean differences in the roles that it might play across different groups. For example, to the extent that certainty has a common meaning as a desirable state and important precondition for action (Chaiken et al., 1989; Petty et al., 2007), the effects of certainty should be the same, even if mean levels differ (e.g., with higher certainty predicting greater attitude-behavior correspondence). But, there may

be cross-cultural differences in the meaning or desirability of certainty, which might limit the cross-cultural generalizability of the current findings. Certainty might be less important for people in East Asian cultures, as they may perceive that a single, constant, univalent evaluation of a given attitude object is unlikely to exist (e.g., Nisbett, Peng, Choi, & Norenzayan, 2001; Riemer, Shavitt, Koo, & Markus, 2014). Further, dispositional attitude certainty might matter less for people from East Asian cultures, because contextualized evaluations and beliefs may be more important and central to their judgments and experiences (Nisbett et al., 2001; Riemer et al., 2014). We should note that these important differences do not necessarily mean that dispositional attitude certainty will be irrelevant to people from East Asian cultures. It may be that when dispositional attitude certainty or its effects are operationalized in a culturally relevant way that such effects would be present and of comparable magnitude to the effects described here (cf. Hardin, Robitschek, Flores, Navarro, & Ashton, 2014). Thus, there are multiple ways to think about whether and how the present results might vary across cultures. These present interesting avenues for future research.

Certainty is important in research on attitudes and persuasion, and the present documentation of individual differences in attitude certainty adds new insights into the antecedents of attitude-specific certainty. Still, there is much to be done, including examining the implications of individual differences in certainty for ambivalently held attitudes and for persuasion, the mechanisms underlying the effects of dispositional certainty, and the cultural boundedness of dispositional certainty and its effects. We believe the present studies provide strong initial documentation of these individual differences and offer a useful approach for assessing dispositional attitude certainty.

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