

**Trait Aggressiveness Predicting Aggressive Behavior:
The Moderating Role of Meta-Cognitive Certainty**

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Abstract

Research on aggression has benefitted from using individual-difference measures to predict aggressive behavior. Research on meta-cognition has recently identified that the predictive utility of individual-difference inventories can be improved by considering the certainty with which people hold their self-views. Merging these two frameworks, the present research examines whether assessing certainty in trait aggressiveness improves its ability to predict aggressive outcomes. Across two studies, participants reported their level of trait physical aggressiveness and the certainty with which they held their responses to the scale (predictor variables). Aggressive behavioral intentions (Study 1 and 2) and actual aggressive behavior (Study 2) were used as dependent measures. As hypothesized, results indicated that certainty moderated the effects of individual-differences in aggressiveness on both aggressive outcomes. Therefore, considering the certainty with which people hold their relevant traits can be useful for understanding aggression, and also for predicting the consistency between personality and behavior.

Keywords: metacognition, certainty, aggressiveness, violence, personality

Aggression is often defined as a behavior that is intended to harm another person who is motivated to avoid that harm (Allen & Anderson, 2017). Aggressive behavior is different from aggressive affect, which includes feelings of anger, hostility, and irritability. Aggressive behavior can be also distinguished from aggressive cognition, which covers factors such as aggressive beliefs, aggressive perceptual schemata, aggressive expectations, and aggressive behavioral scripts (Anderson & Bushman, 2002).

Aggression is one of the most pervasive and destructive issues plaguing modern society. For example, in 2016 the United States police recorded 17,250 homicides (5.3 per 100,000 inhabitants; FBI, 2018). Although the overall homicide rate in Europe is considerably lower, within Spain alone, violence claimed the lives of 326 people in 2016 (0.70 per 100,000 inhabitants; INE, 2018). Beyond its profound social and psychological impact, violence also carries significant economic costs as a result of funding efforts to either reduce or mitigate its consequences when it occurs.

Accordingly, the World Health Organization considers violence as a major public health issue (WHO, 1996) with long-term negative social repercussions (WHO, 2008). For instance, a report issued by the United Nations International Children's Emergency Fund (2012) indicates that a high proportion of teenagers are affected by physical violence.

Personality Predicts Aggressive Outcomes

An important question is to what extent individual differences are partially responsible for aggressive behavior. Over the last twenty years, many individual difference variables have been linked to the prediction of aggressive outcomes, including self-esteem and narcissism (Baumeister, Bushman, & Campbell, 2000), and the Big Five personality traits (Ang et al., 2004). Among all of these individual

differences, there is one personality trait that seems especially relevant: aggressiveness. In 1995, Bushman demonstrated that people with higher (vs. lower) levels of aggressiveness, as measured by the Buss and Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992), showed more attraction to media violence, higher scores in aggressive affect, and more aggressive thoughts and behavior.

In another example showing the predictive validity of individual differences in aggressiveness, participants completed the BPAQ and then allocated the amount of hot sauce they wanted another person to receive. The amount of hot sauce participants gave to confederates was predicted by the BPAQ, especially when considering the Physical Aggressiveness subscale (Lieberman, Solomon, Greenberg, & McGregor, 1999). In sum, most prior research has shown that individuals with an aggressive personality behave more violently (Bushman, 1995), have more aggressive-related attitudes and cognitions (Bushman, 1996), and consume more violence (Lemmens, Bushman, & Konijn, 2006).

In accord with prior research, the Physical Aggressiveness subscale of the BPAQ will be used as a measure of aggressiveness in the current studies. This subscale includes both items assessing frequency of behavior such as, “I get into fights a little more than the average person,” as well as items that refer to expectation of aggression in future hypothetical scenarios such as, “Given enough provocation, I may hit another person.” Beyond the convenience of having a shorter measure of individual differences in physical aggression (Webster et al., 2014), we used this particular subscale because previous experimental research has relied on this particular subscale as the dominant measure for evaluating aggression-relevant outcomes (Anderson et al., 2004; Breuer, Vogelgesang, Quandt, & Festl, 2015; Carnagey, Anderson & Bushman, 2007; Konijn, Neje & Bushman, 2007; Lieberman et al., 1999; Saleem, Anderson & Gentile, 2012).

Although aggressive personality tends to predict a variety of aggressive outcomes (e.g., aggressive behavior, affect, and cognition), there are some exceptions to this well-established relationship. For instance, Marshall and Brown (2006) found that aggressiveness, also measured with the BPAQ, was associated with aggression (i.e., measured with decibel level of shocks of loud noise administered by participants) only when the provocation level was moderate (e.g., participants were told that their essay needed work and that it seemed like little effort was put into it) but not when participants received a strong provocation (e.g., participants were told that their essay was the worst their partner had ever read) or when they were in a non-provocation situation. Moreover, Kiewitz and Weaver (2001) found that trait aggressiveness was not associated with perceptions of violence when interpreting an interpersonal conflict episode.

Taken together, past research suggests that in most but not all cases, trait aggressiveness can accurately predict the occurrence and intensity of aggressive behavior. The goal of the present research is to specify when trait aggressiveness is more likely to predict aggressive outcomes, and to address this apparent gap by pointing to the confidence with which people hold their trait aggressiveness as a moderating variable. Specifically, we hypothesized that the greater the confidence associated with responses to the inventory, the greater its predictive validity.

Confidence Increases the Predictive Validity of Individual Differences Scales

Mental constructs are more predictive of judgment and behavior when people report holding these constructs (e.g., thoughts, attitudes) with high (vs. low) confidence (Petty, Briñol, Tormala, & Wegener, 2007). For example, certainty predicts the correspondence between attitudes and behavior as illustrated by research on attitude strength (Petty & Krosnick, 1995; Rucker, Tormala, Petty, & Briñol, 2014). Just as

attitudes held with certainty are more predictive of behavior, research on self-validation has shown that considering meta-cognitive confidence and doubt is also important in order to understand when self-relevant thoughts, traits, and self-views predict judgments and behavior (Briñol & Petty, 2009; Pelham, 1991; Pelham & Swann, 1994; for reviews on doubt in self-traits and self-conceptions, see Briñol, DeMarree, & Petty, 2010).

As noted, research has shown that as attitude certainty increases, attitudes are more likely to predict and guide people's behavior (Rucker et al., 2014) and as thought certainty increases, thoughts are more likely to guide judgments (Briñol & Petty, 2009). Related to this prior work, self-beliefs held with greater confidence have also been shown to be more predictive of behavior (DeMarree, Petty, & Briñol, 2007). That is, just as thoughts and attitudes held with certainty are more predictive of various judgments and behaviors, self-related beliefs are especially predictive the greater the confidence that people have in their responses to them. Thus, the confidence with which people hold their self-related beliefs (e.g. "I'm cool") has a number of implications for behavior. In general, to the extent that individuals are certain of their self-beliefs, they are more likely to act accordingly. For example, people who are certain that they are humorous and lazy are likely to choose situations that allow them to be funny and avoid those that require them to be productive (Setterlund & Niedenthal, 1993).

Unlike research that examines certainty in global attitudes or general self-views (for a review, see Demarree et al., 2007), recent research has examined certainty in more specific self-related cognitions such as attitudes toward the self. Most of this research has been guided by the self-validation hypothesis (Petty, Briñol, & Tormala, 2002) – the idea that people consider the validity of their thoughts before using them to form judgments. This meta-cognitive feature of the thoughts - confidence in thoughts - is important because as noted above, when thoughts are held with greater confidence,

people are more likely to use them in forming their judgments. On the other hand, if people doubt the validity of their thoughts, the thoughts might not be as impactful on judgments. In general, meta-cognitive confidence magnifies the influence of any mental content, either about oneself or about an irrelevant object, whereas doubt attenuates and sometimes even reverses it (Briñol & Petty, 2009).

Beyond attitudes and traits, there is already some preliminary evidence showing that the predictive utility of individual difference measures can be increased by including measures of confidence in those scales. For example, Shoots-Reinhard, Petty, DeMarree, & Rucker (2015) demonstrated that individual difference scores were more predictive of relevant outcomes when people reported having relatively high (vs. low) confidence in their self-reports of their traits. In one of their studies, this was shown using a well-validated individual-difference inventory commonly used in research on political opinions, the Need to Evaluate scale (NE, Jarvis & Petty, 1996). In this study, participants completed the NE scale and then indicated their certainty in their responses to the NE scale. NE is an individual difference variable that assesses the extent to which people form opinions and think about the world in an evaluative manner (e.g., “I form opinions about everything” or “I want to know exactly what is good and bad about everything”). Previous research had shown that people high in NE are less likely to use “no opinion” response options on surveys (Jarvis & Petty, 1996). Shoots-Reinhard et al. (2015) found that certainty moderated the power of NE to predict the number of “no opinion” response options. As certainty in NE increased, NE became a better predictor of the number of “no opinion” response options selected.

Can Confidence Moderate the Effect of Trait Aggressiveness?

As just noted, prior research suggests that the predictive utility of individual differences scales can be increased by including measures of confidence in those scales

(Briñol & Petty, 2019). However, whether this will also be true in the context of aggressive personality is unknown. On the one hand, prior research suggests that certainty is capable of moderating various constructs ranging from political ideology to self-traits to individual differences variables such as need to evaluate.

On the other hand, some aspects of aggressive personality suggest that this may be a particularly difficult construct to moderate via certainty. First, research indicates that highly aggressive individuals might be relatively uncertain about their own personality. For instance, individuals with low (vs. high) self-concept clarity (a form of self-uncertainty; Lodi-Smith & DeMarree, 2018) were more likely to show aggression following a threat (Bushman & Baumeister, 1998). Second, some research has shown that people with low self-esteem (e.g., another proxy of self-doubt; Carroll, Arkin, & Wichman, 2015) tend to be especially aggressive), report more delinquent behaviors, and have higher scores on trait aggression (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Trzesniewski, Donnellan, & Moffitt, 2006). In sum, it is unclear whether having an aggressive personality will be more predictive of aggression outcomes for individuals who have a high (vs. low) degree of certainty in their propensity for aggressive behavior. Yet, if such a relationship exists, it points to a relatively simple way to increase the predictiveness of measures of aggression.

Overview of the Present Research

In the present research, we examine whether a person's certainty in their responses on a well-validated aggressiveness scale can enhance the scale's ability to predict relevant aggression outcomes. Study 1 examined to what extent personality certainty in physical aggressiveness can help to predict aggressive behavioral intentions. Behavioral intentions are an important construct because they guide attention, information processing (Hamilton, Sherman & Ruvolo, 1990) and can predict future

behavior (DeWall, Twenge, Gitter, & Baumeister, 2009). Study 2 used the same design and procedure, but included behavioral measures of aggression. Given the difficulty of testing aggression in the laboratory, researchers typically use proxies of aggression (Ritter & Eslea, 2005; Tedeschi & Quigley, 1996). Bearing this in mind, a common method of studying aggressive behavior is known as the hot sauce paradigm (Lieberman et al., 1999). In this paradigm, participants are provided with an opportunity to aggress against a target by choosing the amount of extremely spicy hot sauce to give to a fellow participant.

STUDY 1

The goal of this study was to examine whether an individual-difference inventory would predict relevant aggression outcomes to a greater extent when people were certain of their scale responses. The main outcome of interest was aggressive behavioral intentions. Our prediction was that as participants' certainty in their answers to the aggressiveness inventory increased, so would the correspondence of these responses with aggressive behavioral intentions.

Method

Participants and Design. One hundred and sixty undergraduate students (76 males, 78 females, six unidentified gender) from the Universidad Autónoma de Madrid participated anonymously in this study. The age of the participants ranged from 17 to 23 ($M_{age} = 19.26$, $SD = 1.351$). Physical aggressiveness and certainty in those responses were measured as independent variables and aggressive behavioral intentions were measured as the dependent variable. Sample size was determined based on the number of participants that could be collected during the academic semester. Thus, we had little control over the final sample size. However, based on past experience with this

population, we anticipated a reasonable final sample anticipating at least 120 overall which was achieved.¹

Procedure. Participants first completed the physical subscale from the BPAQ (Buss & Perry, 1992). This measure served to classify participants according to their aggressiveness. Participants then reported their certainty in their responses to the aggressiveness scale, after which they completed the dependent measure (aggressive behavioral intentions).

Independent Variables.

Trait Physical Aggressiveness. In order to measure the propensity to act aggressively, we used the Spanish version of the Physical Aggression subscale from the Buss-Perry Aggression Questionnaire. This scale was previously adapted into Spanish by Andreu, Peña and Graña (2002). The subscale consists of 9 items related to physical aggressiveness, and is coded on a Likert-type scale ranging from 1 (Extremely uncharacteristic of me) to 5 (Extremely characteristic of me). The subscale includes items such as “If somebody hits me, I hit back” or “I get into fights a little more than the average person.” Item-ratings were inter-correlated ($\alpha = .82$), thus averaged to form a single measure (for a similar procedure, see Rubio, Garay, Carrasco, & Amor, 2016), ($M = 1.98, SD = 0.75$).

Certainty. Following the BPAQ, participants indicated their certainty in their responses to the questionnaire about violence by completing the following item: “How certain are you in the responses you just gave to the aggression scale?” (1= “Extremely uncertain” to 9= “Extremely certain”). Thus, higher scores on this item indicate greater certainty ($M = 7.02, SD = 1.53$). This measure of confidence was identical to the one used by Shoots-Reinhart et al. (2015).

Dependent Variable.

Aggressive Behavioral Intentions. Participants were asked to assess the likelihood of engaging in aggressive behavior in the future using three 10-point scales. Each item aimed to reflect a dimension of the General Aggression Model (GAM; Anderson & Bushman, 2002; behavioral, cognitive and affective dimensions). Specifically, the general instruction was “In the next month, what is the probability that you...?” (1) “...will have a strong fight with somebody?,” (behavioral dimension) (2) “...will have violent thoughts toward someone?,” (cognitive dimension) and (3) “will have the urge to break an object due to anger?” (affective dimension). Response options ranged from 0% to 100% in intervals of 10% and were coded as 0-10. Ratings on these items were intercorrelated ($\alpha = .81$) and were thus averaged to form an overall aggressive behavioral intentions index. Higher values on this index indicated a greater self-reported likelihood of being involved in an aggressive event or outcome in the future ($M = 3.49$, $SD = 2.51$).

Previous research has established that behavioral intentions are the best verbal predictors of behavior (Fishbein & Ajzen, 1975), and these particular items have been previously used to measure aggressive outcomes (Cárdaba, Briñol, Brändle, & Ruiz-SanRomán, 2016). For instance, having an intention to fight increases the likelihood that that this will occur (Thomas et al., 2013). Therefore, behavioral intentions are a close proxy to actual behavior. So far, aggressive behavioral intentions have been investigated in the context of future events that can happen to other people. However, prior research has not examined whether those events can be applied to the self. For example, Bushman and Anderson (2002) had participants playing either a violent or nonviolent videogame. Next, they were exposed to ambiguous story stems about potential interpersonal conflicts such as a car crashing. As the dependent measure, participants were asked what the main character will do, say, think, and feel as the story

continues. The results indicated that participants who played the violent videogame described the main character as behaving more aggressively, thinking more aggressive thoughts, and feeling more angry than participants who played the nonviolent videogame.

Results

Aggressive Behavioral Intentions. The dependent variable was submitted to a multiple regression analysis. Certainty, Trait Physical Aggressiveness, and the interaction term (i.e., Certainty \times Trait Physical Aggressiveness) were entered as predictors. The critical three-way interaction was tested using the PROCESS add-on for SPSS (model 1; Hayes, 2013). The continuous variables (i.e. trait physical aggressiveness and certainty) were mean-centered to reduce multi-collinearity concerns when computing interaction terms. The DV (i.e. aggressive behavioral intentions) was then regressed onto the predictors (Certainty and Trait Physical Aggressiveness) as well as their interaction term using a hierarchical regression (i.e. main effects in the first step, followed by two-way interaction). Following the suggestion of Cohen and Cohen (1983), all main effects and interactions were interpreted in the first block in which they appeared in the regression analyses.

The regression analysis revealed a main effect of Trait Physical Aggressiveness, $B = 1.845$, $t(157) = 8.309$, $p < .001$, indicating that people higher in trait physical aggressiveness have more aggressive behavioral intentions. We did not find a main effect of Certainty, $B = .002$, $t(157) = .019$, $p = .985$. More importantly, the predicted interaction between Trait Aggressiveness and Certainty was significant, $B = .376$, $95\%CI = (.071, .682)$, $t(157) = 2.431$, $p = .016$. As illustrated in Figure 1, among those with higher certainty scores (analyzed at one standard deviation above the mean), trait physical aggressiveness was positively associated with more aggressive behavioral

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intentions, $B = 2.361$, $t(157) = 7.751$, $p < .001$. For those with lower certainty scores (analyzed at one standard deviation below the mean), a significant relationship also emerged between trait physical aggressiveness and aggressive behavioral intentions, $B = 1.210$, $t(157) = 3.552$, $p < .001$, but the interaction indicates that the predictive utility of the scale was smaller as certainty decreased.

Analyzed differently, this interaction showed that, among participants at higher levels of trait physical aggressiveness (analyzed at one standard deviation above the mean), those at higher scores of reported certainty tended to report more aggressive behavioral intentions than did those at lower levels of certainty, $B = .295$, $t(157) = 1.823$, $p = .070$. In contrast, for participants at lower levels of trait physical aggressiveness (analyzed at one standard deviation below the mean), the opposite trend was found, $B = -.272$, $t(157) = -1.746$, $p = .083$.

Discussion

Certainty moderated the effects of Trait Physical Aggressiveness on aggressive behavioral intentions. As hypothesized, we found that trait aggressiveness predicted aggressive behavioral intentions to a greater extent if participants were certain in their reported trait aggressiveness. Thus, as certainty in individual differences in trait aggressiveness increased, so too did the ability of this trait to predict aggressive behavioral intentions. This indicates that researchers interested in assessing trait aggressiveness could also profitably assess a persons' certainty in this trait. An open question worth examining is whether these effects would hold for actual aggressive behavior.

STUDY 2

Although aggressive behavioral intentions are an important outcome, it is not the only possible response, nor the most important. Thus, the main goal of Study 2 was to

extend the previous findings of the predictive power of certainty relative to a more direct behavioral measure often used in this domain: the hot sauce paradigm (Lieberman et al., 1999; DeMarree & Loersch, 2009). Much prior research has successfully used this paradigm based on the administration of hot sauce as a proxy to measure actual aggression (i.e., in the current paradigm, nobody is forced to eat the hot sauce; McGregor et al., 1998). Once again, we expected a positive relationship between self-reported trait aggressiveness and aggressive behavior. Moreover, this relationship should increase to the extent that participants are certain in their trait aggressiveness, thus also demonstrating the novelty of considering trait aggressiveness certainty on behavioral measures of aggression.

Method

Participants and Design. One hundred and fourteen undergraduate students (18 males, 96 females, one unidentified gender) from Universidad Autónoma de Madrid participated anonymously in this study. The age of the participants ranged from 18 to 23 ($M_{age} = 19.47$, $SD = 1.26$). Trait Physical Aggressiveness and Certainty were measured as independent variables and Aggressive Behavioral Intentions and Aggressive Behavior were measured as the dependent variables. As in Study 1, sample size was determined based on the number of participants that could be collected during the academic semester, anticipating that we would obtain at least 120 overall (given that the design involves just two measured continuous variables).²

Procedure. The research was presented to participants as a pilot study on calibration of materials for other studies. All participants first completed the physical subscale from the BPAQ (Buss & Perry, 1992). This measure served to classify participants in trait aggressiveness. Participants then reported their certainty in their responses to the scale, after which they completed the dependent measures.

Independent Variables.

Trait Physical Aggressiveness. Participants responded to the same Physical Aggression subscale of the BPAQ (Buss & Perry, 1992) as in Study 1. Item-ratings were intercorrelated ($\alpha = .80$), thus averaged to form a single measure ($M=1.79$; $SD=0.69$).

Certainty. Following the BPAQ, participants indicated their certainty using the same item as in Study 1 ($M=7.48$; $SD=1.54$), and as in past research (Shoots-Reinhart et al., 2015).

Dependent Variables.

Aggressive Behavioral Intentions. Participants were asked to assess the likelihood of having aggression-related outcomes and events in the future using the same three 10-point scale items as in Study 1. Item-ratings were inter-correlated ($\alpha = .55$), thus averaged to form an overall aggressive behavioral intentions index ($M = 1.98$, $SD = 1.20$).

Aggressive Behavior. Participants were asked to take part in a decision-making task in which they partnered with another student in the experimental setting. Participants were told that the task involved a game in which they would be fishing from a simulated lake. They were also told that the lake's population of fish could not decrease below a critical level. Prior to beginning the game, participants were asked to select a punishment for their partner if this person over-fished the lake and caused the population to become too low. The instructions were as follows: "You have the chance to punish your partner if they force the lake's population below this critical point. In order to standardize punishment across sessions, those participants who are to be punished will drink a 3 oz. cup of water containing approximately ½ of a teaspoon of hot sauce." Participants were then given a choice between 9 hot sauces arranged in

order of increasing intensity. These sauces ranged from a mild green sauce (“African Rhino Peri-Peri Mild Sauce; Scoville Units 5.6 k”) to an extreme red sauce (“Dragon's Breath; Scoville Units 2.48 million”). Participants could not taste or smell the sauce in advance, nor pour the hot sauce during the study. Also, participants did not receive information about the confederate’s location nor about whether the confederate could retaliate after being given the hot sauce. The intensity of the hot sauce selected served as our behavioral index of aggression (DeMarree & Loersch, 2009; McGregor et al., 1998). Higher numbers represent selection of a more powerful/painful hot sauce and reflect greater levels of aggression towards one’s partner ($M = 4.91$, $SD = 2.98$).

Results

Aggressive Behavioral Intentions. The dependent variable was submitted to a multiple regression analysis following the same procedure as in Study 1. Replicating Study 1, the results indicated a main effect of Trait Physical Aggressiveness, $B = .636$, $t(110) = 4.084$, $p < .001$, showing that people higher in trait physical aggressiveness have more aggressive behavioral intentions. We did not find a main effect of Certainty, $B = -.010$, $t(110) = -.149$, $p = .881$. Of central importance, once again the predicted interaction between Trait Aggressiveness and Certainty was significant, $B = .270$, $95\%CI = (.045, .494)$, $t(110) = 2.382$, $p = .019$. As illustrated in Figure 2 (top panel), among those with higher certainty scores (analyzed at one standard deviation above the mean), trait physical aggressiveness was positively associated with more aggressive behavioral intentions, $B = 1.086$, $t(110) = 4.474$, $p < .001$. For those with lower certainty scores (analyzed at one standard deviation below the mean), no relationship emerged between trait physical aggressiveness and aggressive behavioral intentions, $B = .260$, $t(110) = 1.181$, $p = .240$.

Analyzed differently, this interaction showed that, among participants at higher

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levels of trait physical aggressiveness (analyzed at one standard deviation above the mean), those at higher scores of reported certainty tended to report more aggressive behavioral intentions than did those at lower levels of certainty, $B = .204$, $t(110) = 1.807$, $p = .074$. On the contrary, for participants at lower levels of trait physical aggressiveness (analyzed at one standard deviation below the mean), the opposite trend was found, $B = -.168$, $t(110) = -1.765$, $p = .080$.

Aggressive Behavior. Similar analytical procedures were used as in the prior regression analysis on the measure of aggressive behavior. No main effect of either Trait Physical Aggressiveness, $B = .247$, $t(110) = .598$, $p = .551$, or Certainty, $B = .091$, $t(110) = .488$, $p = .627$ was found. However, most importantly, the predicted interaction between Trait Aggressiveness and Certainty was significant, $B = .659$, 95%CI = (.059, 1.258), $t(110) = 2.177$, $p = .032$. As illustrated in Figure 2 (bottom panel), among those with higher certainty scores (analyzed at one standard deviation above the mean), trait physical aggressiveness was positively associated with more aggressive behavioral intentions, $B = 1.343$, $t(110) = 2.076$, $p = .040$. For those with lower certainty scores (analyzed at one standard deviation below the mean), no relationship emerged between trait physical aggressiveness and aggressive behavioral intentions, $B = -.669$, $t(110) = -1.144$, $p = .255$.

Analyzed differently, this interaction showed that, among participants at higher levels of trait physical aggressiveness (analyzed at one standard deviation above the mean), those with higher scores of reported certainty reported significantly more aggressive behavior than did those at lower levels of certainty, $B = .612$, $t(110) = 2.032$, $p = .045$. On the contrary, for participants with lower levels of trait physical aggressiveness (analyzed at one standard deviation below the mean), the opposite trend was found, $B = -.300$, $t(110) = -1.720$, $p = .245$.

Discussion

As in Study 1, participants' self-reported trait aggressiveness predicted their aggressive behavioral intentions to a greater extent as certainty increased. In addition to replicating Study 1's findings, we also found that certainty moderated the relationship between trait physical aggressiveness and aggressive *behavior*. Thus, we extended the previous findings from intentions to a more direct measure of aggressive behavior. Taken together, these analyses suggest that certainty interacts with trait aggressiveness in predicting aggression outcomes, suggesting that certainty might be a novel and useful construct to consider when predicting aggression-related outcomes.

General Discussion

Across a range of individual difference variables, prior research indicates that asking participants how certain they are that their responses to scale items are descriptive of themselves increases the predictive power of these personality inventories (DeMarree et al., 2007; Shoots-Reinhard et al., 2015). We applied this idea to a classic finding in the aggression domain: the relationship between trait aggressiveness and aggression outcomes.³

In the present research, we proposed that people high in trait aggressiveness would report more aggressive behavioral intentions and behave more aggressively, especially if they report certainty in their aggressiveness scores. Across two studies, the results support our hypothesis that certainty moderates the effects of individual-difference measurements on aggressive behavioral intentions and aggressive behavior. Specifically, we found that trait aggressiveness predicted aggressive behavioral intentions and aggressive behavior to a greater extent if participants were certain in their reported trait aggressiveness.⁴ Thus, as certainty in individual differences in trait aggressiveness increased, so too did the ability of these individual differences to predict

aggressive behavioral intentions and aggressive behavior. Therefore, considering certainty in individual differences can be helpful in predicting and understanding which people are more likely to act on their trait aggressiveness (i.e., those relatively high in their reported certainty in their responses). Or, perhaps any one person varies in certainty at different points in time and thus the measure could be used to predict when any given person is likely to act on his or her aggressiveness (i.e., at times when he or she is feeling certain of the responses).

Because this research involved only measured variables, it is correlational in nature. Since one might raise concerns about reverse causality (i.e., that instead of certainty creating more aggressive responses, aggressive responses lead people to infer certainty), future research should manipulate certainty independent from personality. Indeed, certainty can be measured (as in the current studies) as well as manipulated (Briñol & Petty, 2009). For instance, initial research in self-validation suggested that both measuring and manipulating confidence are effective ways to gauge the impact of people's thoughts on their judgments in the domain of persuasion. In a study demonstrating this idea, participants were asked to think about past situations in which they experienced confidence or doubt following exposure to a message with either strong or weak arguments in favor of a new university exam policy (Petty, Briñol, & Tormala, 2002; Study 3). Participants who articulated past instances of confidence became more certain of the validity of their recently generated thoughts about the message compared to those who reflected upon instances of doubt. That is, the feeling of confidence stemming from the memory exercise was misattributed to the thoughts recently generated about the persuasive message, and affected thought use. As predicted, confidence increased the impact of thought valence (manipulated by argument quality) on attitudes compared to doubt. This fairly direct and blatant

manipulation was successful in demonstrating that people's confidence in their thoughts could be manipulated, and that confidence is consequential for persuasion (for another recent example, see Briñol, Petty, & Requero, 2017).

Future research should also explore other populations different from Spaniards. Applied researchers can also benefit from these studies in important ways (e.g., Cárdbaba et al., 2015; Rivera, Santos, Brändle, & Cárdbaba, 2016). We showed that certainty measures are useful to increase the predictive power of personality inventories regarding aggressiveness. Therefore, implementing a strategy that distracts high-aggressive individuals from their aggressiveness might induce doubt about their personality, thus potentially reducing aggressive outcomes. Finally, we recommend the use of certainty measures as a moderator of individual difference scales because of their ease of use and efficiency, and because measures of certainty increase the predictive validity of these scales. Questions about certainty are easy for aggression researchers to use, they require only a few additional items, and participants should find them easy to answer (Shoots-Reinhard et al., 2015).

The current results extend our knowledge in several ways. For instance, considering meta-cognitive certainty can help us in understanding when trait aggressiveness is more likely to lead to aggressive behavior. Therefore, we can reinterpret past research from this point of view. For instance, one might argue that when the level of provocation is strong, people might doubt their own aggressive personality because that situation can be perceived as too extreme to be true.

Finally, it is worth mentioning that this research is based on the assumption that certainty is associated with properties of validity. Thus, to the extent that certainty or confidence is associated with high validity (e.g., being right), the same results obtained here should emerge. However, to the extent that confidence is associated with low

validity (e.g., arrogance, mental rigidity), a different pattern of results might be obtained. Even the reverse pattern of results would be possible if the meaning of certainty changes, with less correspondence between trait aggressiveness and aggressive outcomes when the level of “invalid” certainty is high rather than low. Therefore, the meaning of certainty in a particular context or for particular people is proposed to moderate the impact that certainty in one’s personality has on subsequent behavior (Briñol, Petty, Santos, & Mello, 2017; Gascó, et al., 2018). Just as the meaning of high certainty can vary across individuals and situations, so too can the meaning associated with lower levels of certainty. For instance, if doubts are too unpleasant or threatening people might try to compensate for that perceived threat by showing compensatory conviction in their trait aggressiveness (Briñol, Petty, & DeMarree, 2015).

Ethics Statement

This research was conducted in accordance with APA guidelines on the ethical treatment of human subjects. The project was approved by the Ethical Committee of the Universidad Autónoma de Madrid and informed consent was provided to all participants.

Acknowledgments

No potential conflict of interest was reported by the authors. The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported in part by the Spanish Government to the second author [grant number PSI2017-83303-C2-1-P] and by a NSF [grant 0847834] to the third author.

References

- Allen, J. J., & Anderson, C. (2017). Aggression and violence: Definitions and distinctions. In P. Sturmei (Ed.), *The Wiley Handbook of Violence and Aggression* (pp. 4-16). UK: John Wiley & Sons.
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology*, *53*, 27-51. DOI: <http://doi.org/d5vs7n>
- Ang, R. P., Ng, A.-K., Wong, S.-S., Lee, B.-O., Oei, T. P. S., & Leng, V. (2004). Relationship between Big Five traits and aggression: A comparison between undergraduates from Australia and Singapore. *Journal of Psychology in Chinese Societies*, *5*, 291-305.
- Andreu, J. L., Peña, M. E., & Graña, J. L. (2002). Adaptación psicométrica de la versión española del Cuestionario de Agresión. *Psicothema*, *14*, 476–482.
- Baumeister, R. F., Bushman, B. J., & Campbell, W. K. (2000). Narcissism, self-esteem, and aggression: Does violence result from low self-esteem or from threatened egotism? *Psychological Science*, *9*, 26-29. DOI: <http://doi.org/bbwm3b>
- Breuer, J., Vogelgesang, J., Quandt, T., & Festl, R. (2015). Violent video games and physical aggression: Evidence for a selection effect among adolescents. *Psychology of Popular Media Culture*, *4*, 305-328.
- Briñol, P., DeMarree, K. G., & Petty, R. E. (2010). Processes by which confidence (vs. doubt) influences the self. In R. Arkin, K. Oleson, & P. Carroll (Eds.), *Handbook of the uncertain self* (pp. 13-35). New York: Psychology Press.
- Briñol, P., & Petty, R. E. (2009). Source factors in persuasion: A self-validation approach. *European Review of Social Psychology*, *20*, 49–96. DOI: <http://doi.org/d5ghcn>

- Briñol, P., & Petty, R. E. (2019). The impact of individual differences on attitudes and attitude change. In D. Albarracín & B.T. Johnson (Eds.), *Handbook of Attitudes* (2nd ed., Vol. 1, pp 520-556). New York: Routledge.
- Briñol, P., Petty, R. E., & DeMarree, K. (2015). Being threatened and being a threat can increase reliance on thoughts: A self-validation approach. In P. J. Carroll, R. M. Arkin, & A. Wichman (Eds.), *Handbook on personal security* (pp. 37-54). New York: Psychology Press.
- Briñol, P., Petty, R. E., & Requero, B. (2017). Aggressive primes can increase reliance on positive and negative thoughts affecting self-evaluation. *Self and Identity*, *16*, 194-214.
- Briñol, P., Petty, R. E., Santos, D., & Mello, J. (2017). Meaning moderates the persuasive effect of physical actions: Buying, selling, touching, carrying, and cleaning thoughts as if they were commercial products. *Journal of the Association for Consumer Research*, *2*, 460-471. DOI: <http://doi.org/csfg>
- Bushman, B. J. (1995). Moderating role of trait aggressiveness in the effects of violent media on aggression. *Journal of Personality and Social Psychology*, *69*, 950-960. DOI: <http://doi.org/b4j6bm>
- Bushman, B. J. (1996). Individual differences in the extent and development of aggressive cognitive-associative networks. *Personality and Social Psychology Bulletin*, *22*, 811-819. DOI: <http://doi.org/c25cpc>
- Bushman, B. J., & Anderson, C. A. (2002). Violent videogames and hostile expectations: A test of the general aggression model. *Personality and Social Psychology Bulletin*, *28*(12), 1679-1686. DOI: <http://doi.org/dd5b5f>

- Bushman, B. J., & Baumeister, R. F. (1998). Threatened egotism, narcissism, self-esteem, and direct and displaced aggression: Does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology*, *75*, 219–229.
- Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology*, *63*, 452-459.
- Carnagey, N. L., Anderson, C. A., & Bushman, B. J. (2007). The effect of videogame violence on physiological desensitization to real-life violence. *Journal of Experimental Social Psychology*, *43*, 489-496. DOI: <http://doi.org/bf6pw9>
- Carroll, P. J., Arkin, R. M. & Wichman, A. (Eds.) (2015). *Handbook on personal security*. New York: Psychology Press.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd Ed.). Hillsdale, NJ: Erlbaum.
- DeMarree, K. G., & Loersch, C. (2009). Who am I and who are you? Priming and the influence of self versus other focused attention. *Journal of Experimental Social Psychology*, *45*, 440-443. DOI: <http://doi.org/dt8tc3>
- DeMarree, K. G., Petty, R. E., & Briñol, P. (2007a). Self-certainty: Parallels to attitude certainty. *International Journal of Psychology and Psychological Therapy*, *7*, 141-170.
- DeWall, C. N., Twenge, J. M., Gitter, S. A., & Baumeister, R. F. (2009). It's the thought that counts: The role of hostile cognition in shaping aggressive responses to social exclusion. *Journal of Personality and Social Psychology*, *96*, 45-59. DOI: <http://doi.org/fh35kw>
- Donnellan, M. B., Trzesniewski, K. H., Robins, R. W., Moffitt, T. E., & Caspi, A. (2005). Low self-esteem is related to aggression, antisocial behavior, and delinquency. *Psychological Science*, *16*, 328–335. DOI: <http://doi.org/dkdrq9>

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior*. Reading, Mass: Addison-Wesley.

Gascó, M., Briñol, P., Santos, D., Petty, R. E., & Horcajo, J. (2018). Where did this thought come from? A self-validation analysis of the perceived origin of thoughts. *Personality and Social Psychology Bulletin*, *44*, 1615-1628.

Hayes, Andrew F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press.

Instituto Nacional de Estadística. (2018). Tasas de homicidios y criminalidad por sexo, tipo de tasa y periodo [Homicide rate and criminality by gender, type of rate and period]. Retrieved

from <http://www.ine.es/jaxi/Datos.htm?path=/t00/ICV/dim6/10/&file=61104.px>

Jarvis, W.B.G., & Petty, R.E. (1996). The need to evaluate. *Journal of Personality and Social Psychology*, *70*, 172-194. DOI: <http://doi.org/b9gvf4>

Kiewitz, C., & Weaver III, J. B. (2001). Trait aggressiveness, media violence, and perceptions of interpersonal conflict. *Personality and Individual Differences*, *31*, 821-835. DOI: <http://doi.org/bsxp9f>

Konijn, E. A., Nije Bijvank, M., & Bushman, B. J. (2007). I wish I were a warrior: The role of wishful identification in effects of violent videogames on aggression in adolescent boys. *Developmental Psychology*, *43*, 1038-1044.

Lemmens, J. S., Bushman, B. J., & Konijn, E. A. (2006). The appeal of violent video games to lower educated aggressive adolescent boys from two countries.

Cyberpsychology & Behavior, *9*, 638-641. DOI: <http://doi.org/fh973r>

- Lieberman, J. D., Solomon, S., Greenberg, J., & McGregor, H. A. (1999). A hot new way to measure aggression: Hot sauce allocation. *Aggressive Behavior*, 25, 331-348. DOI: <http://doi.org/ctnmdd>
- Lodi-Smith, J., & DeMarree, K. G. (Eds.). (2018). *Self-Concept Clarity: Perspectives on assessment, research, and application*. New York: Springer.
- Marshall, M. A., & Brown, J. D. (2006). Trait aggressiveness and situational provocation: A test of the traits as situational sensitivities (TASS) model. *Personality and Social Psychology Bulletin*, 32, 1100-1113. DOI: <http://doi.org/dft4sd>
- McGregor, H. A., Lieberman, J. D., Greenberg, J., Solomon, S., Arndt, J., Simon, L., & Pyszczynski, T. (1998). Terror management and aggression: Evidence that mortality salience motivates aggression against worldview-threatening others. *Journal of Personality and Social Psychology*, 74, 590-605.
- Pelham, B. W. (1991). On confidence and consequence: The certainty and importance of self-knowledge. *Journal of Personality and Social Psychology*, 60, 518-530.
- Pelham, B. W., & Swann, W. B., Jr. (1994). The juncture of intrapersonal and interpersonal knowledge: Self-certainty and interpersonal congruence. *Personality and Social Psychology Bulletin*, 20, 349-357. DOI: <http://doi.org/fshxmg>
- Petty, R. E., Briñol, P., & Tormala, Z. L. (2002). Thought confidence as a determinant of persuasion: The self-validation hypothesis. *Journal of Personality and Social Psychology*, 82, 722-741. DOI: <http://doi.org/c32qm7>
- Petty, R. E., Briñol, P., Tormala, Z. L., & Wegener, D. T. (2007). The role of meta-cognition in social judgment. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social Psychology: Handbook of basic principles* (2nd ed., pp. 254–284). New York, NY: Guilford Press.

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Petty, R. E., & Krosnick, J. A. (1995). *Attitude strength: Antecedents and consequences*. Hillsdale, NJ: Erlbaum.

Ritter, D., & Eslea, M. (2005). Hot sauce, toy guns, and graffiti: A critical account of current laboratory aggression paradigms. *Aggressive Behavior, 31*, 407-419.
DOI: <http://doi.org/dzzvvc>

Rivera, R., Santos, D., Brändle, G., & Cárđaba, M.A. (2016). Design effectiveness analysis of a media literacy intervention to reduce violent videogames consumption among adolescents: The relevance of lifestyles segmentation. *Evaluation Review, 40*, 142-161. <http://doi.org/cw3m>

Rubio-Garay, F., Carrasco, M. A., & Amor, P. J. (2016). Aggression, anger and hostility: evaluation of moral disengagement as a mediational process. *Scandinavian Journal of Psychology 57*, 129–135. DOI: <http://doi.org/crvc>

Rucker, D. D., Tormala, Z. L., Petty, R. E., & Briñol, P. (2014). Consumer conviction and commitment: An appraisal-based framework for attitude certainty. *Journal of Consumer Psychology, 24*, 119-136. DOI: <http://doi.org/f5rvpf>

Saleem, M., Anderson, C. A., & Gentile, D. A. (2012). Effects of prosocial, neutral, and violent videogames on children's helpful and hurtful behaviors. *Aggressive Behavior, 38*, 281-287. DOI: <http://doi.org/f32xr6>

Setterlund, M. B., & Niedenthal, P. M., (1993). “Who am I? Why am I here?” Self-esteem, self-clarity, and prototype matching. *Journal of Personality and Social Psychology, 65*, 769-780.

Shoots-Reinhard, B., Petty, R. E., DeMarree, K. G., & Rucker, D. D. (2015). Personality certainty and politics: Increasing the predictive utility of individual

difference inventories. *Political Psychology*, 36, 415-430. DOI:

<http://doi.org/f7jrfh>

Tedeschi, J. T., & Quigley, B. M. (1996). Limitations of laboratory paradigms for

studying aggression. *Aggression and Violent Behavior*, 1, 163-177. DOI:

<http://doi.org/c8fv5w>

Thomas, J., Gage, S. H., McMurrin, M., McDonald, S., & Munafò, M. R. (2013).

Increasing recognition of happiness in ambiguous facial expressions reduces anger and aggressive behavior. *Psychological Science*, 24, 688-697. DOI:

<http://doi.org/f4x8rv>

Trzesniewski, K. H., Donnellan, M. B., & Moffitt, T. E. (2006). Low self-esteem during

adolescence predicts poor health, criminal behavior, and limited economic

prospects during adulthood. *Developmental Psychology*, 42, 381-390. DOI:

<http://doi.org/fcf9sw>

Federal Bureau of Investigation. (2018). 2016 Crime in the United States. Retrieved

from [https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-](https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-pages/tables/table-12)

[pages/tables/table-12](https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-pages/tables/table-12)

Webster, G. D., DeWall, C. N., Pond, R. S., Deckman, T., Jonason, P. K., Le, B. M., ...

& Smith, C. V. (2014). The brief aggression questionnaire: Psychometric and

behavioral evidence for an efficient measure of trait aggression. *Aggressive*

Behavior, 40(2), 120-139.

World Health Organization. (2008). Manual for estimating the economic costs of

injuries due to interpersonal and self-directed violence. Retrieved from

http://www.who.int/violence_injury_prevention/violence/activities/economics/en/

Yeager, D. S., Trzesniewski, K. H., & Dweck, C. S. (2013). An implicit theories of

personality intervention reduces adolescent aggression in response to

victimization and exclusion. *Child Development*, 84, 970-988. DOI:

<http://doi.org/f4xjtt>

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Figure 1. Study 1. Aggression behavioral intentions as a function of Trait Physical Aggressiveness and Personality Certainty.

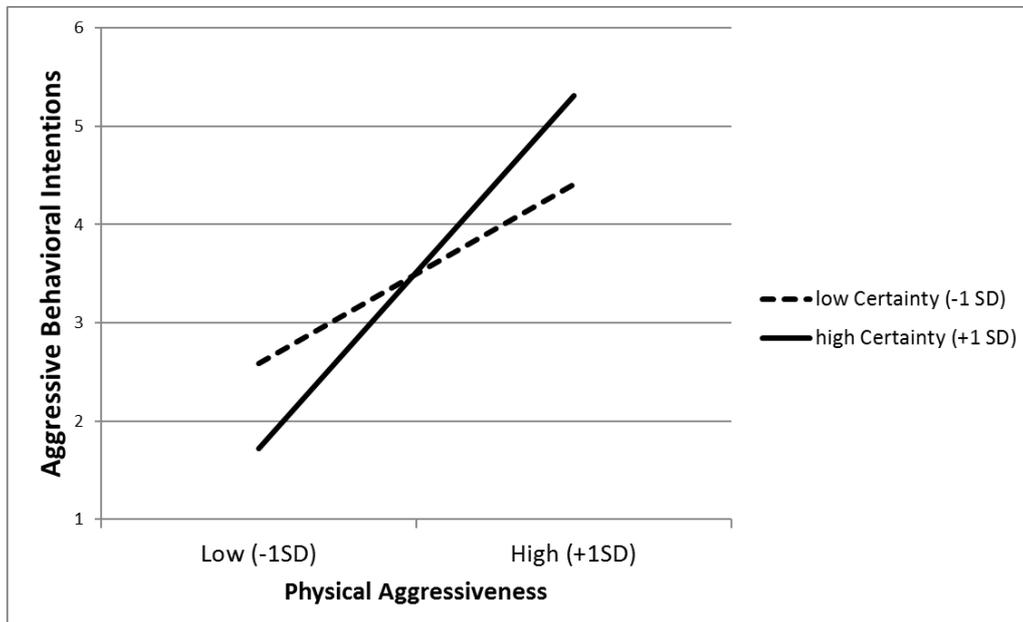
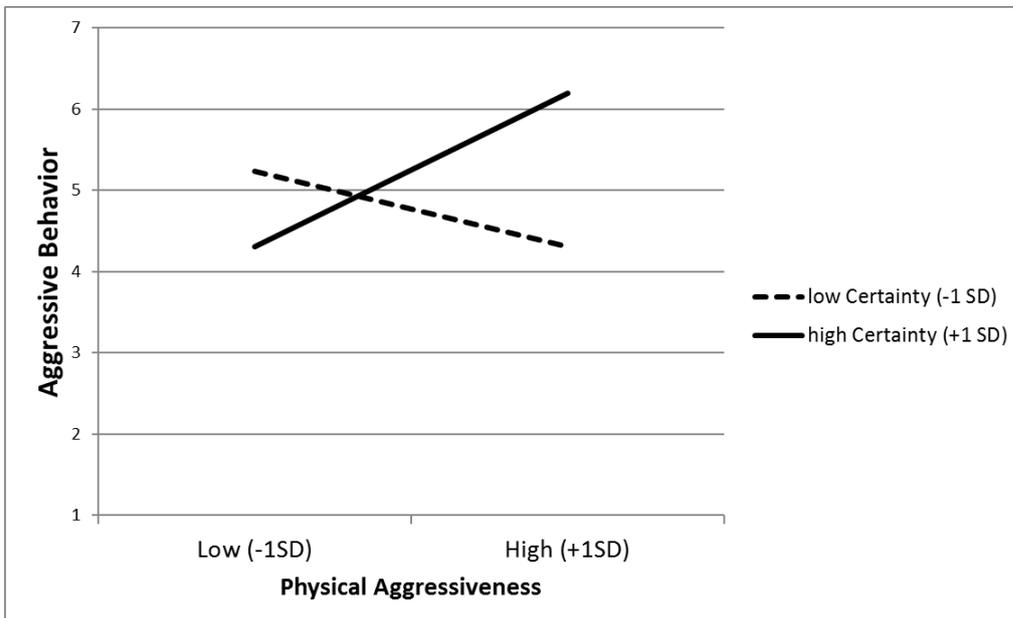
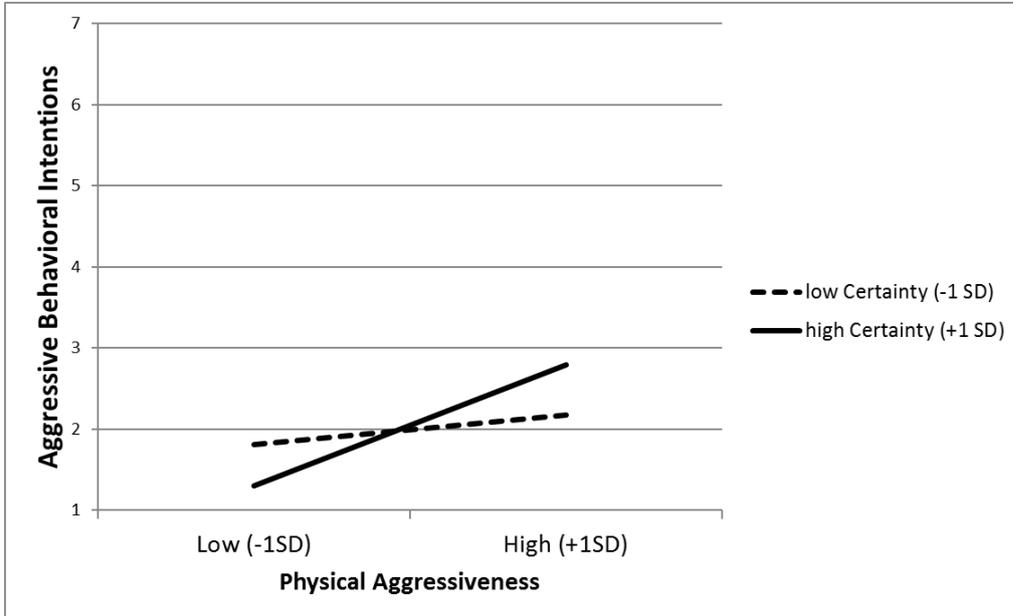


Figure 2. Study 2. Aggressive Behavioral Intentions (top panel) and Aggressive Behavior (bottom panel) as a function of Trait Physical Aggressiveness and Personality Certainty.



Footnotes

¹ Post-hoc power analysis indicated that the sample had a power of .53 to detect the interaction effect size obtained.

² Post-hoc power analysis indicated that the sample had a power of .61 to detect the interaction effect size obtained for aggressive behavioral intentions and of .59 for aggressive behavior.

³ One additional study was collected in this line of research. This study used the same design and materials as the ones reported in the main text. In this additional study we ended up with fewer participants than the studies reported in the main text by the end of the semester. Specifically, 105 participants completed the physical aggressiveness measure, reported their certainty in their responses to the scale, and also provided their aggressive behavioral intentions. Although the regression analysis revealed a non-significant two-way interaction, $B = .145$, 95% CI = (-.339, .629), $t(102) = .595$, $p = .553$, the pattern of results was similar to the ones reported in the text. Importantly, when we collapsed this additional data set with the two studies reported in the main text, all the key effects remained significant. Before aggregating the information from the three data sets, we standardized the independent and dependent measures, and included study as a factor. Notably, the regression analysis revealed the predicted two-way interaction between Trait Aggressiveness and Certainty was significant, $B = .170$, 95% CI = (.071, .269), $t(375) = 3.362$, $p < .001$. Moreover, this two-way interaction was not further moderated by Study, $B = -.043$, 95% CI = (-.166, .080), $t(371) = -.686$, $p = .493$.

⁴ The correlation between aggressive behavioral intentions and aggressive behavior in Study 2 was significant ($r = .168$, $p = .013$), but was not further moderated by Certainty ($B = .048$, $t(109) = .292$, $p = .771$), though the trend was for the correlation to be higher when certainty was high. We would not expect certainty to be a strong moderator of this relationship because in this particular case, confidence refers to the metacognitive certainty about people's responses to the aggression questionnaire and not certainty about their aggressive behavioral intentions. Changing the construct for which people are certain about is consequential in this case.