# Creating Your Own Hostile Environment: A Laboratory Examination of Trait Aggressiveness and the Violence Escalation Cycle

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*A dyadic interactive aggression paradigm tested hypotheses from the General Aggression Model about how trait aggressiveness can create behaviorally hostile social environments. Pairs of college student participants competed in a modified reaction time task in which they repeatedly delivered and received each other's punishments. The trait aggressiveness of both participants influenced the punishment intensities (aggression level) set by each member of the dyad on later trials. Furthermore, there was a pattern of escalation from early to later trials. These trait aggressiveness effects (both self and partner) on later aggressive behavior were largely mediated by partner aggression levels during early trials. Results also suggested two aggressive motives—hostile and instrumental—resulted from high partner aggression during early trials and these motives partially mediated the effects of trait aggressiveness and of early trial aggression on later aggressive behavior.*

***Keywords:*** *aggression; violence; escalation; aggressive personality*

People differ in their propensity for aggression and violence. Some children, some adolescents, and some adults are involved in interpersonal conflicts much more frequently than their peers. Sometimes initially mild conflicts escalate into more severe forms of physically aggressive or even violent behavior.

Two major types of factors contribute to observed individual differences in frequency and intensity of such aggressive encounters—person factors (e.g., trait aggressiveness) and situation factors (e.g., provocation). Modern personality and social psychological theories have converged in suggesting that not only are both types of factors important in determining social behavior but that they also influence each other. For example, general social cognitive models of behavior (e.g., Bandura, 1986; Cervone, 2005; Mischel & Shoda, 1995; Sedikides & Skowronski, 1990), as well as more specific social cognitive models of aggression (e.g., C. A. Anderson & Bushman, 2002; C. A. Anderson & Huesmann, 2003; Huesmann, 1986), note that repeated exposure to certain types of situations can yield relatively stable changes in person factors and that person factors can influence the type of social environments people will likely inhabit.

There are at least four ways in which personological and situational factors interact. First, in any specific social encounter, both types of factors may statistically interact in determining behavior in that encounter. For example, hunters behave more aggressively when provoked in the presence of assault weapon photos than in the presence of hunting weapon photos, whereas nonhunters display the opposite pattern (Bartholow, Anderson, Carnagey, & Benjamin, 2005). Such person-by-situation

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interactions are fairly common in social psychology (e.g., Ross & Nisbett, 1991). The remaining three ways that personological and situational factors interact all involve one type of factor causing changes in the other. One way involves repeated experiences in the same type of situation, which over time can create relatively stable changes in the individual, essentially a change in personality. For example, research shows that repeated exposure to violent entertainment media leads to fairly stable changes in aggressive personality (e.g., C. A. Anderson et al., 2003; Bushman & Huesmann, 2006). Conversely, personality factors influence situational exposure in two ways. In one case, they can influence the types of situations people choose to frequent (D. M. Buss, 1987). For example, many of Europe's "football (soccer) hooligans" attend matches of their favorite teams in large part because of the possibility of getting into fights (Kerr & de Kock, 2002; Murphy, Williams, & Dunning, 1990; Zani & Kirchler, 1991). In the other case, person factors influence the course of an interaction or series of social interactions (D. M. Buss, 1987). This case differs from choosing types of situations to frequent in that this latter process involves creating a particular atmosphere out of the several possibilities that exist for a specific situation. For instance, an aggressive child might create a hostile school environment by the way he or she treats other schoolchildren. Although the first three ways that personological and situational factors interact have received considerable empirical attention in the aggression domain, relatively little has focused on the fourth way, in which person factors dynamically change the situation itself.

The General Aggression Model (GAM; e.g., C. A. Anderson & Bushman, 2002; C. A. Anderson & Carnagey, 2004; C. A. Anderson, Gentile, & Buckley, 2007; C. A. Anderson & Huesmann, 2003) explicitly postulates both directions of causal dynamic processes between situational and personological factors. Most of our recent empirical research has focused on how one specific situational factor—exposure to violent entertainment media—can foster both temporary and more permanent changes in aggression-related knowledge structures and behavioral tendencies (C. A. Anderson et al., 2003; C. A. Anderson et al., 2007; Carnagey & Anderson, 2005). This article focuses on the long-neglected dynamic process by which an existing individual difference variable can influence situational factors. Specifically, we tested the hypothesis that differing levels of trait aggressiveness can influence social behaviors in such a way as to create a relatively more (or less) hostile situational context, even in a tightly controlled dyadic interaction. Furthermore, this study design allowed us to test whether high trait aggressiveness increases the likelihood of pairs of individuals getting into the early stages of a violence escalation cycle. Finally, this study allowed a preliminary examination of whether a violence escalation cycle in this context was mediated by hostile motives (i.e., motivation to harm the other person), instrumental motives (i.e., motivation to influence the other person's behavior), or some combination of these motives (cf. Bushman & Anderson, 2001).

## HOW TRAITS CAN CHANGE SITUATIONS

Figure 1 displays the episodic processes portion of the GAM. A person variable, such as trait aggressiveness, can eventually change the meaning of a specific situation or social encounter by affecting actions (thoughtful or impulsive) taken in the early cycles of the encounter. Prior research reveals that individuals high in trait aggressiveness respond to pain with more aggressive thoughts (e.g., K. B. Anderson, Anderson, Dill, & Deuser, 1998), interpret ambiguous situations in a more hostile manner (e.g., Dill, Anderson, Anderson, & Deuser, 1997), and behave more aggressively (e.g., Bushman & Wells, 1998; A. H. Buss & Perry, 1992) than low trait aggressiveness individuals. If placed in a potential conflict situation, such as getting bumped in a bar, a high trait aggressiveness person is more likely to think aggressively about the encounter, interpret the bump as an intentional aggressive act, and respond with some type of aggressive behavior than is a low trait aggressive person. This aggressive reaction in turn changes the meaning of the situation for others involved in the bumping incident, especially the person targeted for retaliation (usually, the original bumper). This sets the stage for further retaliation in the next cycle of the social encounter.

Many situational contexts routinely provide opportunities for such differential interpretations and responses by high versus low aggressive individuals. For example, competitive sports games frequently involve painful physical contact; such contact may be interpreted either as an incidental part of the game or as an intentional, inappropriate, and outside-the-rules provocation. Indeed, Bushman and Wells (1998) found trait aggressiveness effects on penalties in hockey games, penalties that frequently are the result of an overreactive aggressive retaliation to normal and rule-appropriate behavior.

## VIOLENCE ESCALATION CYCLE

Most acts of violence result from a series of conflict-based interactions that involve two (or more) parties trading retaliatory behaviors in an escalating cycle. This is true of what might be termed "ordinary" violent crimes such as assault and murder as well as violence between larger groups and even nations (Rubin, Pruitt,

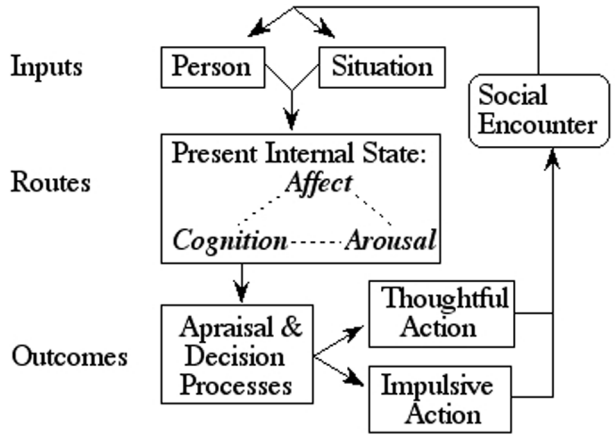


**Figure 1** Single episode portion of the general aggression model.
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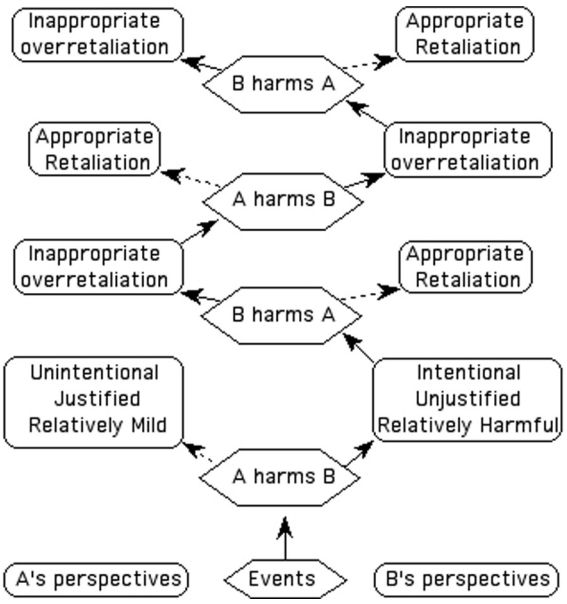


**Figure 2** Violence escalation cycle.
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& Kim, 1994). Figure 2 illustrates such a cycle, proposed and discussed in more detail by C. A. Anderson and Carnagey (2004).

In this model, "A" and "B" represent any dyadic units that come into conflict, whether it be two people, two groups, two religions, or even two nations. An initial triggering event sets the cycle in motion; the triggering event may be relatively minor or major. One person's "appropriate and justified" retaliation is the other person's next provocation. Though the initial triggering event may be lost in the distant past, once started, the cycle tends to persist. One only needs to read news accounts of the latest Israeli–Palestinian conflicts or the current quagmire in Iraq to find examples of how prevalent and persistent these perspective differences are.

Several key points about the cycle deserve mention. First, violence begets violence. Unfortunately, people and nations involved in such cycles frequently cannot "see" what seems apparent to outside observers. In part, this is because people tend to perceive others' actions as being caused by their dispositions, whereas they perceive their own actions as appropriate responses to the situation (e.g., C. A. Anderson, Krull, & Weiner, 1996; Lassiter, Geers, Munhall, Ploutz-Snyder, & Breitenbecher, 2002; Swann, Pelham, & Roberts, 1987). By failing to perceive and predict the impact of our own actions on others, we behave in ways that perpetuate the violence cycle.

Second, retaliations tend to escalate over time. Escalation may be absolute (i.e., more extreme than the most recent provocation) or relative (i.e., more extreme than one's own most recent retaliation). It is unclear what variables predict when escalation will or will not occur and whether escalation will tend to be absolute or relative.

Third, the upward pressure to ever-increasing levels of violence stems largely from perspective biases in which the most recent perpetrator views the harmful act that perpetrator just committed as appropriate and justified, whereas the most recent victim views the harmful act committed against the victim as an inappropriate overreaction. This victim perception then serves as justification for further "appropriate" retaliation.

Finally, this model is not about how or whether one gets into the initial conflict situation but is all about how people's responses to the situation influence and change the situation. From the personological perspective of the present research, this model suggests that people who tend to view the world as a hostile place and who tend to use aggressive behavior in conflict situations will be the ones most likely to turn a potential conflict situation into an actual hostile one involving the escalation cycle. And of course, this model can be extended to groups or nations that differ in their propensity to perceive hostility and to use aggressive tactics in conflict situations (e.g., C. A. Anderson & Carnagey, 2004).

## TRAIT AGGRESSIVENESS AND VIOLENCE ESCALATION

In short, one reason aggressive individuals are in so many hostile situations may be because their behavioral styles turn potential conflict situations into actively hostile

ones. Similarly, it may be that nonaggressive individuals are in relatively few hostile situations because they successfully defuse potential conflicts. To test this main hypothesis in a clean and conservative way, we measured trait aggressiveness on a large sample of college students, placed them into a repetitive competitive situation that had the potential to become a hostile conflict, and allowed them to interact only by computer and only by exchanging punishments for each loss in the competition. The punishment settings, controlled by the participants, were the measures of aggressive behavior. Thus, the only social exchange involved physically aggressive behavior. Other ways in which high trait aggressive people might create escalating hostile situations, such as by use of verbal aggression, were intentionally closed off to allow a specific test of whether the physical aggression aspect of trait hostility could, by itself, provoke higher levels of aggression.

We also measured the perceived likability of the partner, level of hostile aggression motivation, and level of instrumental aggression motivation. The liking and motivation measures were hypothesized as potential mediating variables of the effects of trait aggressiveness and of early trial aggressive behavior on late trial aggression. However, for both practical and methodological reasons (Lindsay & Anderson, 2000), they were given retrospectively, after the competition task was complete. Thus, some caution in interpretation is warranted.

## HYPOTHESES

Despite the highly constrained nature of our paradigm, we expected that (a) participants' trait aggressiveness would predict their aggressive behavior in the competitive situation; (b) partners' trait aggressiveness would influence participants' aggressive behavior; (c) for at least some participants (e.g., those high on trait aggressiveness), there would be an escalation of aggression over time; (d) aggressive behavior on early trials would at least partially mediate the trait aggressiveness effect on aggressive behavior during the later trials; and (e) hostile aggression motivation would at least partially mediate both the trait aggressiveness and the early trial aggression effects on late trial aggressive behavior. We tested these hypotheses with a series of regression and maximum likelihood path analyses.

## METHOD

### Participants

A total of 284 participants (154 male, 130 female) were recruited from the psychology participant pool at a large midwestern university and were given course credit in exchange for their participation. Participants completed the study in same-sex pairs.

### Materials

*Trait aggressiveness*. The A. H. Buss and Perry (1992) Aggression Questionnaire (AQ) consists of 29 items in four subscales assessing trait physical and verbal aggression, anger, and hostility. Respondents indicate the extent to which they agree with the statements on a 7-point scale anchored at 1 (*extremely uncharacteristic of me*) and 7 (*extremely characteristic of me*). Agreement with statements such as "I get into fights a little more than the average person" and "I can't help getting into arguments when people disagree with me" indicate higher physical and verbal aggression, respectively. Agreement with statements such as "I have trouble controlling my temper" and "I wonder why I sometimes feel so bitter about things" indicate higher anger and hostility, respectively. This scale has been shown to correlate with a wide range of aggression-related variables in both laboratory and field settings. We used the total AQ score as the measure of trait aggressiveness ($M$ = 2.86, $SD$ = 0.84). In our sample, coefficient alpha was quite high, .92.[1]

*Other questionnaire items*. The questionnaire also contained two standard personality questionnaires and background items. Specifically, it included the Dissipation/Rumination scale, the Emotional Stability scale, and items on age, sex, ethnicity, ACT score, and grade point average. All of these questionnaire items as well as the trait aggressiveness questionnaire were administered by a computer program using SuperLab software. These additional items were included to help sell the cover story that the study was about "personal characteristics" and reaction time.

*Aggressive behavior*. The competitive reaction time (CRT) task used in this study was a modification of the same basic computer program used by C. A. Anderson and Dill (2000); C. A. Anderson, Anderson, Dorr, DeNeve, and Flanagan, M. (2000); Bushman (1995); and others. It is based on the Taylor Competitive Reaction Time (TCRT) task, a widely used and externally valid measure of aggressive behavior (see C. A. Anderson & Bushman, 1997; C. A. Anderson, Lindsay, & Bushman, 1999; Bushman & Anderson, 1998; Carlson, Marcus-Newhall, & Miller, 1989; Giancola & Chermack, 1998). In this computer-based task, the participant's goal is to click the mouse button sooner than his or her opponent after receiving auditory and/or visual cues. When participants lose, they hear a punishing noise blast delivered over a set of headphones.

Each trial begins with the participants' setting a noise intensity level they desire to send to their opponent by clicking on a scale that ranges from 0 to 10. These punishment settings constitute the measure of aggressive behavior. In some versions of this task, noise blast duration can also be set by the participant; this was not the case in the present experiment.

In a typical study using the TCRT, there is no real opponent, and the punishment levels received by the participant are actually predetermined by the researchers and delivered by computer. In this study, however, there was a real opponent who set punishment intensities for the participant and those punishments were delivered on the "lose" trials.

Wins and losses were preset by the researchers and controlled by the computers. Participants completed 25 competitive reaction time trials, winning 13 and losing 12; the apparently random pattern of wins and losses was the same for each participant and began with a loss. After each trial, participants were shown on their computer screen the noise level (0 to 10) set by their partner (i.e., their opponent). After a "lose" trial, they also received the noise blast set by their partner. Actual noise intensity for Level 0 was 0 dB, Level 1 corresponded to 55 dB, and the intensity level increased by 5 dB for each of the subsequent levels to a maximum of 100 dB at Level 10. Several aggressive behavior measures were created from these 25 noise intensity settings and are described in the Results section.

*Affect and motivation.* Participants rated the likability of their partner with four items using 7-point rating scales (1-7). Specifically, participants indicated whether they thought their partner was (a) *disliked* (1) or *liked* (7) more than the average college student, (b) *more mean* (1) or *more nice* (7) than the average college student, (c) *less friendly* (1) or *more friendly* (7) than the average college student, and (d) *less aggressive* (1) or *more aggressive* (7) than the average college student ($M$ = 4.53, $SD$ = 0.75). Coefficient alpha for this scale was .75.

Participants also indicated what motivated their behavior in the CRT task. The motives scale, from C. A. Anderson and Murphy (2003), consisted of six items rated for "the extent to which this motive describes your motive when deciding on where to set the noise levels" during the CRT task, using a 5-point rating scale (1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a lot*). Four items assessed hostile motives (e.g., "I wanted to hurt my opponent"); coefficient alpha was .78 ($M$ = 1.57, $SD$ = 0.75). Two items assessed instrumental motives (e.g., "I wanted to control my opponent's level of responses"); coefficient alpha was .67 ($M$ = 1.94, $SD$ = 0.92).

### *Procedure*

Participants were run in same-sex pairs in 1-hr sessions.[2] To protect participants' anonymity, partners had staggered starting times and stayed in separate rooms. On completion of consent procedures, each participant was read a set of standardized instructions concerning the study. Participants were told that the purpose of the study was to examine the relationship between personal characteristics and ability to react fast. They were further told that they would fill out some questionnaires on a computer and compete in a reaction time task against another participant. Because there were two real participants in different rooms, and because the two participants were not allowed to meet or see each other, the experimenter moved back and forth between the rooms giving the initial instructions. The experimenter communicated with each participant via intercom after the initial instructions.

For one participant in each dyad, the experimenter then explained the competitive reaction time task, had the participant practice setting and hearing noise intensities, and then administered the computer-based personality questionnaires. For the other participant, the personality questionnaires were completed first. Preliminary analyses yielded only minor differences between these two orders on any of the measured variables, differences that had no impact on the main hypotheses.[3] Therefore, the order manipulation will not be discussed further. Finally, participants filled out the postexperimental questionnaire on affect and motivation and were debriefed.

## RESULTS

Each participant served as a partner as well as a participant. Because participants within each pair actually exchanged noise blasts, their responses are not truly independent. This raises interesting questions about how best to analyze these data. We analyzed self-generated aggressive behavior as a function of standardized self and partner AQ scores, using the Actor-Partner Interdependence Model (Kashy & Kenny, 2000; Kenny, Kashy, & Cook, 2006). Specifically, we used the SAS procedures recommended by Campbell and Kashy (2002).[4]

There are several ways in which aggressive personality could influence aggressive behavior in this recurring interaction paradigm. One is that only the participant's own personality significantly influences aggressive behavior. If so, analyses would reveal only a main effect of the participant's own level of trait aggressiveness (self-AQ scores). Such a finding would call into question either the utility of this CRT version to assess dyadic

interaction effects or the theoretical proposition that high trait aggressiveness can change the aggressiveness of a situation merely through its effects on aggressive behavior. A second possibility is that the aggressive personality of one's partner also influences one's own aggressive behavior through its impact on the partner's aggression choices in early trials. If so, analyses would reveal main effects of both self and partner AQ scores on overall aggression (across all 25 trials) as well as in early and later trials.

A third possibility is that self and partner trait aggressiveness combine interactively. This could happen in any of three ways, each of which would produce a statistical interaction of self and partner AQ scores. First, if both members of a pair are high on trait aggressiveness, their competition could escalate into delivering very high noise blasts at each other, more so than a simple additive model would suggest. Second, if one member of a pair is high on trait aggressiveness, both could end up giving high-intensity noise blasts of a magnitude that is similar to pairs consisting of two high trait aggressiveness individuals. Third, if one member of a pair is low on trait aggressiveness, both could end up giving low-intensity noise blasts of a magnitude similar to pairs of low trait aggressiveness individuals. The various interaction possibilities would be revealed either by a Self AQ × Partner AQ interaction or by a three-way interaction involving self AQ, partner AQ, and trial block (early vs. late). Our first two hypotheses stated that both self and partner AQ scores would influence the participant's aggressive behavior but did not specify whether these effects would be additive or interactive. In fact, none of the Self AQ × Partner AQ effects were significant, so they will not be discussed further.

### *Overall Aggression Level*

*Average intensity.* Two overall aggression level measures were created and analyzed—average intensity of punishment settings (possible range 0-10, $M = 4.30$, $SD = 1.87$) and total number of high-intensity punishment settings across the 25 CRT trials (possible range 0-25, $M = 2.93$, $SD = 5.09$). High-intensity settings are settings of 8, 9, or 10 (Bartholow & Anderson, 2002; Giancola, 2003). The results were very similar and supported our first two hypotheses. For both measures, there were two main effects of AQ (self and partner) and no interaction ($F$s < 1).

On average, males gave louder noise blasts than females did, $M$s = 4.75 and 3.78, respectively, $F(1, 162) = 10.67$, $p < .005$. More important, the main effects of self and partner AQ scores also were significant even after controlling for sex: self AQ $F(1, 201) = 6.61$, $p < .05$, $b = .29$; partner AQ $F(1, 202) = 4.89$, $p < .05$, $b = .25$, respectively. Figure 3 illustrates this effect. People who scored high on trait aggressiveness (AQ) did indeed behave more aggressively than those who scored low. Furthermore, the partner AQ effect indicates that individuals with high trait aggressiveness scores elicited relatively more aggression than did those with low trait aggressiveness scores. Because participants' only interaction with partners was through the CRT punishment settings, the effect of partners' personality necessarily resulted from the partners' punishment settings.

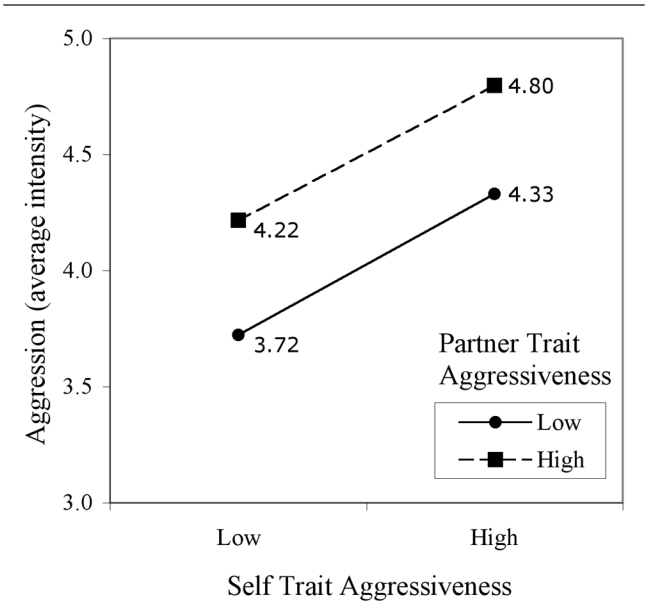


**Figure 3** Average punishment intensity across 25 trials as a function of self and partner trait aggressiveness.
NOTE: Predicted means are at 1 standard deviation below (Low) and above (High) the average self and partner Aggression Questionnaire scores, the measure of trait aggressiveness.

*Number of high-intensity settings.* Males also made more high-intensity noise blast settings than females did, $M$s = 3.63 and 2.09, respectively, but this effect was only marginally significant, $F(1, 165) = 3.52$, $p < .07$. Self and partner AQ scores both yielded significant effects: self AQ $F(1, 195) = 6.32$, $p < .05$, $b = .79$; partner AQ $F(1, 196) = 8.33$, $p < .01$, $b = .89$. Self and partner trait aggressiveness were both positively associated with the number of times high-intensity punishments were selected.

The effects of self and partner trait aggressiveness were of a very similar magnitude on both measures of aggressive behavior. That is, the slopes linking self and partner trait aggressiveness to self-generated aggressive behavior in the CRTs task were essentially the same, with the self AQ slope's being slightly larger than the

corresponding partner slope for the average intensity measure, and the partner AQ slope's being slightly larger that the corresponding self slope for the high-intensity measure.

### *Aggression After Losing Versus Winning*

Average intensity settings were examined to see whether trial block and outcome of the prior trial had a systematic impact. We compared the average intensity set by participants after trials that they had lost (and thus had received a noise blast set by their partner) with their average setting after trials that they had won. The outcome (win/lose) of the prior trial had no appreciable impact on intensity settings, $F(1, 140) < 1$. Furthermore, neither self nor partner trait aggressiveness interacted with outcome, $p$s $> .15$.

### *Escalation*

For each participant, we computed a slope between trial number (1-25) and intensity settings such that positive slopes indicated an increase in intensity settings from early to later trials, negative slopes indicated a decrease, and slopes of zero indicated no change. The average slope was significantly greater than zero, $M = 0.0242$, $F(1, 139) = 13.54$. $p < .001$. Thus, this situation was conducive to escalation in general. The sex effect was nonsignificant, $F(1, 154) = 1.01$, $p > .3$.

Furthermore, self AQ scores were positively related to escalation ($b = .0155$), $F(1, 223) = 6.86$, $p < .01$. On average, high self AQ participants (i.e., those with trait aggressiveness scores 1 standard deviation above the mean) increased their final intensity settings by almost 1 full scale value, (.0242 + .0155) x 24 trials = .953, over their Trial 1 settings, whereas those with trait aggressiveness scores 1 standard deviation below the mean increased their intensity settings by a mere .209. Partner trait aggressiveness had no appreciable independent impact on escalation, $F < 1$.

### *Aggressive Behavior Cycle: Trait Aggressiveness and High-Intensity Settings*

Additional analyses were conducted on the number of high-intensity punishments to further examine the underlying aggression cycle and to test the implications of our fourth hypothesis. We expected that (a) both self and partner trait aggressiveness would influence punishment settings on early and later trials, (b) partner aggression on early trials would in turn influence the participant's punishment settings on the later trials, and (c) statistically controlling for partner aggression on early trials would reduce or eliminate the effect of self and partner AQ scores on late trial aggression.

We focused these analyses on the high-intensity punishments (settings greater than 7).[5] The high-intensity punishments are particularly interesting because these are the types of provocations most likely to yield serious conflicts in the real world. We began this set of analyses by creating two high-intensity scores for each participant, the total for the first 15 trials ($M = 1.32$, or 8.8%) and the total for the last 10 trials ($M = 1.61$, or 16.1%). We selected this breakdown (first 15 and last 10) because there were relatively few high-intensity settings on early trials. Thus, more trials were needed in the "early" category to ensure that there were sufficient numbers of high-intensity settings to allow a meaningful analysis. As can be seen by the percentages, the use of high-intensity punishments increased considerably in the later trials, nearly doubling (also indicating escalation). These two scores were then divided by the number of trials (15 and 10 for early and late trials, respectively) to put them into the same metric. This difference between early and late trial use of high-intensity settings illustrates that an escalation effect occurred on high-intensity settings and was significant, $F(1, 139) = 31.25$, $p < .001$.

As predicted, both self and partner AQ scores were positively associated with number of high-intensity punishments delivered during the early trials: self AQ $F(1, 223) = 5.25$, $p < .05$, $b = .0253$; partner AQ $F(1, 224) = 10.87$, $p < .01$, $b = .0360$. Similar effects were found for self and partner AQ scores on number of high-intensity punishments delivered on the later trials: self AQ $F(1, 187) = 5.86$, $p < .05$, $b = .0409$; partner AQ $F(1, 188) = 4.52$, $p < .05$, $b = .0355$.

Furthermore, partner aggression on early trials (high-intensity punishments) was positively associated with participants' use of high-intensity punishments on later trials even after controlling for self and partner AQ scores, $F(1, 165) = 51.83$, $p < .001$, $b = .1028$. When partner's early aggression was in the statistical model, neither self nor partner AQ scores predicted participants' later aggression, $p$s $> .05$. Sobel tests indicated that partner aggression on early trials was a significant mediator of both self and partner AQ effects on late trial aggressive behavior, $z$s $= 2.96$ and 2.24, $p$s $< .01$ and .05, respectively. In sum, trait aggressiveness levels of participants and their partners influenced aggressive behavior on early trials, which in turn largely determined high-intensity aggression on later trials.

Figure 4 further illustrates these results with a maximum likelihood path analysis of these effects. As can be seen, the full mediation model fits the data quite well. Both self and partner AQ influenced the partner's use of high-intensity punishments on early trials, which in turn largely determined the person's own use of high-intensity punishments on late trials. This occurred even when sex effects were statistically controlled.

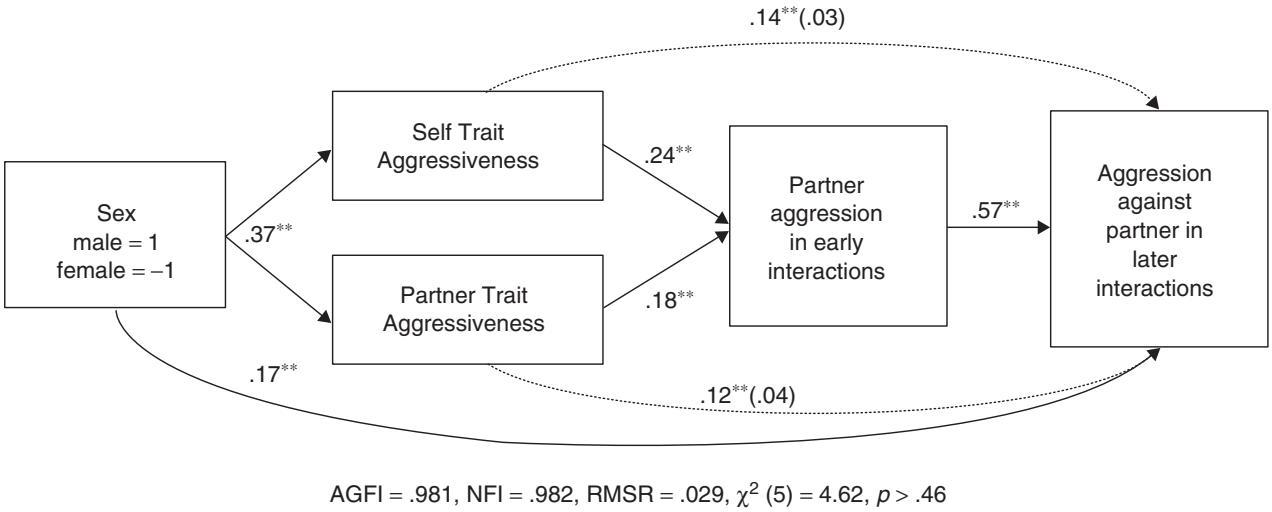


**Figure 4** Path analysis of trait aggressiveness effects on aggressive behavior in the last 10 trials with aggressive behavior by one's partner in the first 15 trials as a mediating variable.
NOTE: Path weights in parentheses are from the model that included the mediating variable. Fit indexes are for the model with the two nonsignificant paths removed. AGFI = adjusted goodness of fit index; NFI = normed fit index; RMSR = root mean square residual.
$^{**}p < .05$.

### *Likability and Aggressive Motivation*

Our fifth hypothesis was that hostile aggression motivation would at least partially mediate the trait aggressiveness and the early trial aggressive behavior effects on late trial aggression. We also thought that two additional variables—perceived likability of the partner and instrumental aggression motivation—might also serve as important mediators. Regression analyses were conducted on the likability, hostile aggression motivation, and instrumental aggression motivation measures to assess the impact of self and partner AQ scores and partner aggression.

With sex in the model, the negative relation between self AQ scores and likability ratings for the partner was only marginally significant, $F(1, 275) = 3.48$, $p < .07$, $b = -.0878$. The partner AQ effect was slightly smaller, $F(1, 276) = 1.75$, $p < .20$, $b = -.0616$. When partner aggression (number of high-intensity punishments) was added to the statistical model, both of these AQ effects shrank further ($F$s $< 1$), but the partner aggression term was highly significant, $F(1, 188) = 50.68$, $p < .001$. Higher levels of partner aggression were associated with lower liking for the partner. This is consistent with the idea that a high level of trait aggressiveness increases aggressive behavior, which in turn leads to a decrease in liking for the person doing the aggressing.

Participants' hostile motive scores (i.e., self-reported motivation to harm the partner with noise settings) were positively associated with both self and partner AQ scores: self AQ $F(1, 238) = 34.32$, $p < .001$, $b = .2598$; partner AQ $F(1, 239) = 4.12$, $p < .05$, $b = .0892$. It is interesting that the self AQ score slope was more than twice the size of the partner AQ slope.

Partner aggression itself was strongly associated with hostile motives, even with sex, self AQ, and partner AQ in the model, $F(1, 186) = 96.02$, $p < .001$, $b = .3658$. Not surprisingly, higher levels of partner aggression were associated with greater reported use of the punishments by the participant to harm the partner. It is interesting that adding partner aggression to the model reduced the partner AQ effect on hostile motives to nonsignificance ($F < 1$), but the self AQ effect remained significant, $F(1, 276) = 26.09$, $p < .001$, $b = .1962$. Nonetheless, Sobel tests indicated that partner aggression at least partially mediated the self and partner AQ effects on hostile motives, $z$s $= 2.16$ and 2.49, $p$s $< .05$. In other words, the effects of the partner's level of trait aggressiveness on the participant's intent to harm him or her appeared to operate primarily through the partner's aggressive behavior. This is not surprising, given that the interactions took place only through the CRT task. In contrast, the participant's own level of trait aggressiveness still had an independent effect on his or her hostile motives.

Instrumental aggression motive scores also were positively associated with self AQ scores, $F(1, 279) = 8.98$, $p < .005$, $b = .1750$. However, the effect of partner AQ

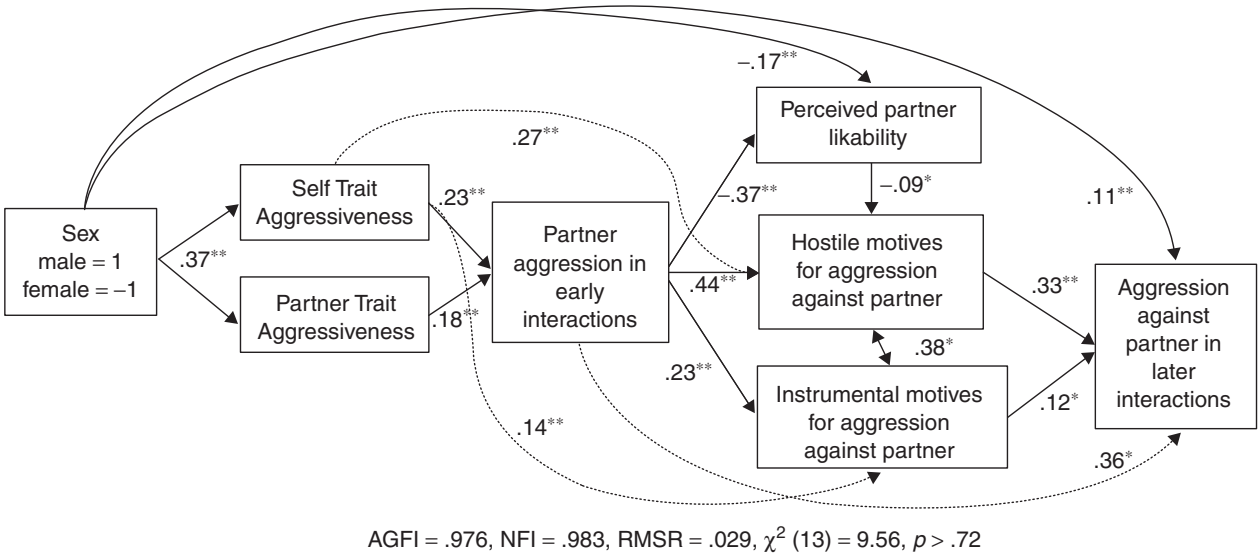


**Figure 5** Path analysis of trait aggressiveness effects on aggressive behavior in the last 10 trials with aggressive behavior by one's partner in the first 15 trials, perceived partner likability, hostile aggression motives, and instrumental aggression motives as mediating variables. AGFI = adjusted goodness of fit index; NFI = normed fit index; RMSR = root mean square residual.
*$p < .10$. **$p < .05$.

did not approach significance, $F < 1$. Adding partner aggression to the model reduced but did not eliminate the self AQ effect on instrumental motives, $F(1, 271) = 4.85$, $p < .05$, $b = .1247$. The partner aggression effect was significant as well, $F(1, 169) = 36.02$, $p < .001$, $b = .2997$. Higher levels of partner aggression were associated with greater use of the punishments to control the partner's performance. The Sobel test revealed that partner aggression partially mediated the self AQ effect on instrumental aggression, $z = 2.08$, $p < .05$.

### *Likability and Motives as Mediating Variables*

Additional regression and path analyses were conducted to test the hypothesis that hostile aggression motivation would mediate the effects of trait aggressiveness and of early trial aggressive behavior on late trial aggression. Likability and instrumental aggression motivation were also included in the model as potential mediators.[6] In this model, only three variables uniquely predicted use of high-intensity noise blasts in the later trials: hostile motives, $F(1, 271) = 38.22$, $p < .001$, $b = .9803$; instrumental motives, $F(1, 210) = 5.77$, $p < .05$, $b = .3101$; and early trial aggression, $F(1, 273) = 30.35$, $p < .001$, $b = .8072$.

To further test and more simply present the results, we conducted a path analysis of the full model. Figure 5 illustrates the results. As can be seen in Figures 4 and 5, the final model fit the data well, and the main hypotheses were supported. Hostile and instrumental aggression motives largely mediated the effects of self AQ, partner AQ, and partner's early trial use of high-intensity punishments on one's own aggression in the late trials. Furthermore, aggressive behavior in the early trials had a direct effect on perceived partner likability, instrumental aggression motives, and especially on hostile aggression motives. Sobel tests indicated that both hostile motivation and instrumental motivation partially mediated the effect of partner early-trial aggression on aggression against the partner in the later trials, $z$s = 5.16 and 5.21, respectively, $p$s $< .001$. Of course, this entire dynamic process was set in motion by one's own and one's partner's level of trait aggressiveness. In short, typically aggressive people do sometimes create their own hostile environments simply by engaging in slightly higher levels of physical aggression in ambiguous situations.

Other findings of interest also emerged from this analysis. Self AQ had significant direct effects on both aggression motives. High trait aggressiveness participants reported higher levels of hostile and instrumental aggression motivation than did low trait aggressiveness participants even after their partner's use of high-intensity punishments on the early trials was controlled for. In addition, even though the direct effect of the partner's early aggression on one's own late trial aggression was reduced by the aggression motivation mediating variables (i.e., from .57 in Figure 4 to .36 in Figure 5), it still was an important predictor.[7] Finally, the results of the two motive measures, especially the facts that both were significant predictors of late trial aggression and were

positively related to each other, support the theoretical position that hostile aggression and instrumental aggression do indeed co-occur and contradict the strictly dichotomous position that a given act of aggression is either hostile or instrumental (Bushman & Anderson, 2001).

## DISCUSSION

### *Main Findings*

The emerging picture is consistent with the GAM's view of how individual difference factors (e.g., trait aggressiveness) and situational factors (e.g., the aggressive behaviors of others) influence a series of ongoing aggressive social interactions. Aggressive individuals created a more hostile and aggressive environment for themselves by virtue of their heightened physically aggressive behavior on early trials. Even more impressive are the strength and magnitude of these effects in a relatively nonaggressive population, namely, college students. A college student population necessarily includes relatively few extremely aggressive individuals, such as age-mates who have been convicted of violent crimes. We expect even stronger individual difference effects in a population that is more representative of the full range of trait aggressiveness.

All five of our initial hypotheses were supported. Self-reported trait aggressiveness predicted participants' aggressive behavior in the CRT task. Partner trait aggressiveness predicted participants' aggressive behavior in the CRT task. Even though the CRT task typically takes less than 15 min, escalation of aggressive behavior occurred systematically. Aggressive behavior on early trials mediated the effects of self and partner trait aggressiveness on later trials. And hostile aggression motivation was an important mediator of all these effects.

The fact that these effects emerged in such an "artificial" laboratory setting lends further evidence of the external validity of the CRT paradigm in at least two ways. First, any time an individual difference variable known to predict aggressive behavior in a variety of settings is tested in a new setting, it provides an opportunity to see whether the new setting yields similar results. The self AQ score effects clearly support the external validity of the CRT task. Second, in the present version of the CRT, the two participants were in fact exchanging noise blasts. This interactive modification to the standard CRT task provided a unique opportunity to see whether a personality-based cycle of aggression could be induced in this tightly controlled paradigm. Indeed, the repeated finding of significant partner AQ effects on multiple measures of self-aggression lends further support to the external validity of this interactive CRT paradigm.

Perhaps the most important finding from this work is that we successfully modeled in a laboratory context the fourth way that aggressive people are commonly believed to produce high levels of aggression: by creating hostile aggressive escalation situations for themselves. To our knowledge, this is the first time this dynamic process has been successfully tested under tightly controlled laboratory conditions. The findings also support our theoretical analysis of the aggression escalation cycle and the GAM, on which it was based.

### *Related Phenomena*

Earlier research in several domains has investigated ways in which prior expectations and personality traits can systematically influence the course of dyadic interactions, often without the awareness of the participants in those interactions. For example, there is a long tradition of research into competitive versus cooperative choices in iterative Prisoner's Dilemma games. It shows that competitive individuals tend to force initially cooperative partners into becoming competitive themselves (e.g., Kelley & Stahelski, 1970; Kuhlman & Wimberley, 1976). Similarly, the behavioral confirmation literature demonstrated how a randomly assigned initial belief about a future interaction partner could channel social interactions in ways that confirm that initial belief (e.g., Snyder & Swann, 1978a, 1978b). But the current work is the first to successfully model how an aggressive personality trait can create an aggressive escalation cycle.

## LIMITATIONS AND UNANSWERED QUESTIONS

One limitation involves the use of a college student sample. An obvious question concerns the extent to which the present findings generalize to other populations. For example, what about a broader sample of adults? We believe that the trait aggressiveness effects are likely to be even larger in such a sample, primarily because it would have relatively more individuals with very high trait aggressiveness scores, individuals who because of their aggressive tendencies do not get into or cannot remain in college. In a sense, a college student sample suffers somewhat from a restricted range (or lower variance) of trait aggressiveness, a phenomenon that generally reduces trait effect sizes. Similarly, we believe that the present effects also will likely be larger in younger populations—such as elementary, middle, and high school students—for two reasons: a greater range of trait aggressiveness and a lesser ability to self-monitor and self-moderate aggressive inclinations.

A second limitation of the present work concerns the timing of measurement of mediating variables. The perceived likability and aggression motivation measures were taken after completion of the CRT task. This was necessary for a host of methodological reasons but of course is not ideal. Future work, perhaps with a different dyadic interaction task that is more extended in time, might allow assessment of these types of mediating variables prior to the final measure of aggression. Of course, one major problem with such a procedure concerns the potentially biasing effect of prior measurement of aggressive thoughts and feelings on subsequent aggressive behavior (e.g., Lindsay & Anderson, 2000).

There are a host of unanswered questions about the aggression escalation cycle. Some concern factors that may reduce or increase the escalation tendency. For example, does the ability to verbally communicate with the partner have an impact? What about audience effects? Does an apology help break the cycle? Other questions concern factors that might influence when escalation is absolute (greater than the opponent's last attack) versus relative (greater than one's own last attack). Availability of resources is likely one such factor, with low-resource entities (individuals, groups) having to resort to relative escalation. Such relative escalation can readily be seen in ongoing conflicts around the world. The use of clandestine bombings (suicide or other) and other "terrorist" tactics in Iraq, for example, should be expected when the conventional war-making capabilities of opposing sides are so hugely uneven.

## CONCLUDING COMMENTS

Throughout this article, we have emphasized how people who are high in trait aggressiveness create hostile environments for themselves and others. However, it also is important to recognize a more socially positive aspect of our results. Specifically, low trait aggressiveness participants did not get carried away by the situation even when paired with a high trait aggressive partner. To be sure, the partner AQ main effects on the participant's aggressive behavior, and the absence of Self × Partner AQ interactions, indicate that even nonaggressive participants were affected. But in general, low trait aggressive individuals were less likely to be involved in escalatory aggression. Of course, there may be other social circumstances in which the behavior of one highly aggressive individual is sufficient to make even a normally nonaggressive person retaliate at extremely high levels. A looming physical threat to one's children might be one such real-world circumstance. Although this did not happen in this research, the interactive CRT paradigm developed here provides a laboratory tool for further investigation of such potential effects.

Finally, we think it important to highlight the magnitude of the self and partner trait aggressiveness effects. For the high-intensity noise blasts—the type of aggression most likely to stimulate escalating aggression and violence in real-world contexts—the pairing of two people who self-reported being fairly aggressive individuals (one standard deviation above average) led to a considerably higher level of aggressive behavior (2.3 high-intensity punishments in the last 10 trials) than the pairing of two low trait aggressive individuals (0.8 high-intensity punishments). And this occurred without any evidence of a statistical Self × Partner Trait Aggressive ness interaction but instead was the result of two main effects. This may help explain why a relatively small minority of people are involved in the majority of truly aggressive and violent encounters in the real world (DeLisi, 2005). Our findings also help explain how even nonaggressive people can get drawn into aggressive exchanges by the highly aggressive individuals with whom they cross paths.

## NOTES

1. One reviewer suggested that we examine each subscale individually to see if there were different effects on aggressive behavior. Three of the subscales—physical aggressiveness, verbal aggressiveness, and anger—yielded essentially the same results as the overall scale. The trait hostility subscale yielded considerably weaker effects. To simplify the presentation and to avoid capitalizing on chance, we report only the full Aggression Questionnaire (AQ) scale results.

2. Males commonly (but not universally) behave more aggressively than females on the competitive reaction time task and also tend to score higher on measures of trait aggressiveness. Statistically controlling for sex of dyad is therefore a conservative procedure in studies in which the main focus is on trait aggressiveness, not sex differences (Baumeister, 1988). Nonetheless, we included sex in the statistical models. Note that dropping sex from the models resulted in stronger trait aggressiveness effects.

3. Those who performed the competitive reaction time (CRT) task first tended to behave more aggressively.

4. We thank two anonymous reviewers for this suggestion. We used SAS PROC MIXED with the restricted estimation maximum likelihood procedure along with the Satterthwaite approximation to determine the denominator degrees of freedom. This procedure takes into account the nonindependence of dyadic data, more accurately reports denominator degrees of freedom, and yields varying denominator degrees of freedom, including fractional degrees of freedom. In addition, two participants had missing data on one or more variables. An alternative statistical approach also was used. Data from participants in Room A and Room B were modeled separately but with parameter estimates constrained to be equal for the two models, using PROC SYSLIN from the SAS software package. The resulting *F*-values and parameter estimates from these two approaches were very similar and resulted in the same outcomes and interpretations. We thank Professor Douglas Bonett for suggesting this alternative procedure.

5. Using average intensity scores yields essentially the same results.

6. All three of these variables were standardized for this analysis, in which they were used as mediating variables.

7. The correlation matrix on which the path analyses were based may be accessed at http://www.psychology.iastate.edu/faculty/caa/abstracts/2005-2009/08ABCcorr.pdf

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