



aggression across two cueing contexts, during a stress-focused condition or a confederate-focused condition.

### Context-Specific Effects of Rumination

Besides anger and aggression, rumination has also been implicated in the exacerbation of other mood states. For example, Nolen-Hoeksema et al. [1999] have shown that persons who are instructed to focus on their symptoms and feelings following a sad mood induction experience increases in sad mood, which potentially lead to longer and more severe depressive episodes. Davey [1995] in turn has shown that ruminative rehearsal following exposure to a phobic stimulus increases participants' anxious responding and interferes with the natural extinction of fear after removal of the feared stimulus. In essence, the effects of rumination are to enhance and maintain an individual's emotional state that has been previously primed by a *particular cueing context* (e.g., depressive mood induction, exposure to feared stimulus, direct provocation by another). Persons with a tendency toward perseveration would become preoccupied with thoughts that correspond to the particular cues in their environment. The type of cognitive preoccupation, in turn, influences the behavioral responding that results.

In terms of aggression, direct provocation or insult has been shown to elicit more aggression among those who ruminate than those who do not [Collins and Bell, 1997]. Bushman [2002] also found that direct provocation led to greater aggression in participants who were given the opportunity to ruminate than in participants who were distracted. In the current study, the stressful context did not involve direct provocation or insult by a confederate; instead half of the participants were exposed to a physical stressor during the aggression procedure. It was examined whether rumination would lead to more or less aggression during exposure to a fearful and distracting stressor, compared to a context in which the focus is solely on the confederate's poor performance.

### Gender Differences in the Rumination–Aggression Link

Gender differences in aggression have been well established [Eagly and Steffen, 1986; Bettencourt and Miller, 1996]; however, little research has examined gender differences in the impact of trait rumination on aggression. Nolen-Hoeksema and colleagues [Nolen-Hoeksema, 1991; Nolen-Hoeksema and Jackson, 2001] have confirmed that women are more likely than men to ruminate after a sad mood induction, and the greater likelihood of ruminative responses in women may explain the higher incidence of major depression in women than men. However, women have also been shown to choose distraction rather than rumination as a way of cognitively dealing with *anger*-inducing situations [Rusting and Nolen-Hoeksema, 1998]. In this prior study, however, the researchers only examined participants' angry mood states and not their actual aggressive behavior.

Given the differential socialization experiences for men and women, it would be important to examine whether cognitive preoccupation in women vs. men would lead to greater aggression in a laboratory paradigm where such aggression is facilitated. In one seminal study, Frodi [1978] found that men were more likely to rouse themselves to anger and aggression against a provocateur after they were instructed to write about their thoughts and feelings. Women's preoccupation, on the other hand, was less anger-related. To follow up on this experiment, we examined whether trait rumination (and not manipulation of rumination)

predicted aggressive behavior in both genders, and under different cueing contexts (stress-focused vs. confederate-focused).

### Measures of Trait Rumination

In previous research on rumination and aggression, researchers have relied on measures of rumination that index cognitive experiences specific to anger and revenge, such as Caprara's [1986] Dissipation-Rumination Scale (e.g., "I will always remember the injustices I have suffered") or the Anger Rumination Scale [Sukhodolsky et al., 2001; "I keep thinking about events that angered me for a long time"]. Other measures of trait rumination index participants' tendencies to focus on their current mood state, such as Nolen-Hoeksema's Response Styles Questionnaire [Nolen-Hoeksema and Morrow, 1991], which was developed to gauge participants' cognitive responses to depressed mood. These types of rumination questionnaires are effective in identifying participants who ruminate under particular instigating contexts (anger vs. depression, respectively). However, they have drawbacks in that they can confound the process of rumination (perseverative thinking about events or feelings) with the outcomes of that rumination (anger or depressed mood). In addition, the use of these measures makes it difficult to understand gender differences in rumination. If the rumination questionnaire deals with anger (or depression) experiences, men (or women) may score higher on the particular measure. One of the strengths of the current study is that participants were administered a measure of trait rumination, the Rumination subscale of the Rumination-Reflection Questionnaire (RRQ-R) [Trapnell and Campbell, 1999], that taps into general ruminative tendencies not specific to a particular emotion or context (e.g., "it is hard for me to shut off thoughts about myself").

### Current Study and Predictions

*Overview of study.* In the current study, participants engaged in a laboratory aggression paradigm in which they were to administer electric shocks to a confederate. Frustration about, and cognitive focus on, the confederate's poor performance was manipulated through a cover story in which all participants, in the role of "supervisors", were told to administer shocks to a putative "employee" after incorrect responses to simulate *criticism* of job performance, as in a work situation. Feedback about the employee's performance (number of errors made by the employee) was given to participants after every block of trials. These procedures were intended to ensure that the participants became frustrated and focused their attention on the confederate's (poor) performance, and that their shock responses would clearly represent punishment for negative performance and unhelpful behavior.<sup>1</sup>

*Aims and predictions.* There were two primary aims to the current research. First, the effect of trait rumination and a *fearful/distracting context* on aggression was examined by exposing half of the participants to chronic and unpredictable air blast administrations to the throat (stress-focused) during the aggression paradigm, whereas the other half of the participants

<sup>1</sup>Participants were not directly provoked or insulted by the confederate because this would probably obscure the effects of the two cueing contexts (stress-focused and confederate-focused) on aggressive behavior. The research literature consistently reports a natural escalation in aggression across trial blocks, which has been attributed to the participants' increasing frustration in response to the confederate not mastering the material as quickly as expected [Thompson and Kolstoe, 1974; Goldstein et al., 1975]. Thus, the frustration instructions used and the systematic feedback about the confederate's poor performance served to systematize an inherent frustration effect.

were not exposed to this stressor (confederate-focused). As discussed above, ruminative experiences serve to enhance the current emotional state *that is consistent with the cueing context*. Thus, it was hypothesized that the stressor would cause ruminative participants to focus on the air blasts to which they were exposed and they would experience more fear and apprehension under this condition. Those in the confederate-focused condition would instead perseverate on the frustration they experience with regard to the confederate's poor performance, and these effects would be evident in participants' aggressive responses, evaluations of the confederate, and mood state. The second aim involved analyzing gender differences in the rumination–aggression link. We conducted aggression analyses separately by gender to examine whether rumination increases aggression under different cueing contexts for men and women. Based on prior work [Frodi, 1978; Kring and Gordon, 1998], it was predicted that ruminative women would experience more fear and distress in the stress-focused condition, and ruminative men would experience more hostility and aggression in the confederate-focused condition.

## METHOD

### Participants

Participants included 50 undergraduates (26 women), recruited from introductory psychology classes. They were scheduled by telephone for participation and received 2 hr of course credit and \$10 compensation for participation. Informed, written consent was obtained from all individuals prior to participation. The average age of the sample was 20 years ( $SD = 2.9$ ), and most participants were Caucasian Americans (94%,  $n = 46$ ). There were no significant differences between men and women on any of the demographic variables. Assignment to cueing context occurred during the experimental testing session.

### Mass Testing Session

Participants completed aggression and anger trait measures during an initial mass testing session that occurred before participants were called to participate in the experimental session. This was done, not as a screening process, but instead to prevent participants from inferring the true purpose of the subsequent experimental session (i.e., to measure aggressive response). The participants were administered the Aggression Questionnaire (AQ) [Buss and Perry, 1992] and the Anger Expression Scale (AX) [Spielberger et al., 1985]. The AQ is a 29-item inventory containing four factors: Physical Aggression (nine items), Verbal Aggression (five items), Anger (seven items), and Hostility (eight items). Test–retest correlations ranged from .72 to .80 for the four subscales, and internal consistency was also adequate (from .77 to .85). The mode of anger expression was measured through scores on the subscales of Spielberger's 20-item AX Scale: Anger In, Anger Out, and Anger Control. Test–retest stability coefficients for the AX scales range from .64 to .86 [Spielberger and Sydeman, 1994]. Coefficient alphas for the AX/Out scale are estimated at .73, while for the AX/In scale the alpha coefficients range from .70 to .84 [Knight et al., 1988; Spielberger et al., 1985]. These were analyzed later to confirm that participants in the two cueing contexts did not differ on aggression-relevant traits (and that random assignment worked).

## Experimental Procedures

*Baseline measures.* After signing the consent form, participants completed a demographic sheet and the rumination and state mood scales. Tendencies toward rumination were measured before the experiment using the 12-item *RRQ-R* [Trapnell and Campbell, 1999]. The internal consistency (alpha) of the rumination subscale is .90. The *RRQ-R* has also been shown to effectively differentiate between dysfunctional ruminative experiences and more psychologically minded reflection and exploration [Trapnell and Campbell, 1999]. It is the former, and not the latter, that best relates to exacerbation of negative mood states. Continuous scores on the *RRQ-R* were used as the independent variable in analyses to examine the full relationship between tendencies toward rumination and aggression and hostility variables. Utilizing a median-split or group approach for the rumination independent variable (i.e., high and low ruminators) was considered disadvantageous due to the arbitrary nature of such cut-offs and because relationships between dichotomized scores are often restricted.

Participants also completed a *state* version of the 60-item *Positive and Negative Affect Schedule* (PANAS) [Watson et al., 1988] at baseline, and then again at the end of the experimental blocks. To reduce unnecessary multiple testing, analyses for the PANAS scales were conducted only on the following mood scales that were most relevant to the purposes of the study: the higher order negative affect (NA; ten items) and positive affect (PA; ten items) scales, and the lower-order fear (six items), hostility (six items), guilt (six items), sadness (five items), and joviality (eight items) scales. Internal consistency for the positive and negative affect scales is very high (.89 and .85, respectively) [Watson et al., 1988], and shows excellent convergent and discriminant validity [Clark and Watson, 1991]. Changes from baseline to post-experiment (baseline–post) in ratings on the PANAS were used to examine the efficacy of the context manipulation.

*Instructions and aggression paradigm.* After completing pre-experiment forms, participants were introduced to another student (actually a confederate of the experimenter), and both were told that the study involved an investigation of the effects of distraction on supervisor and employee performance. Participants drew lots to determine the roles of “supervisor” and “employee”, with the real participant always assigned the role of supervisor. The confederate and participant were led to separate rooms, where each purportedly received independent instructions. The participant was told that the employee (i.e., confederate) would perform a digit memory task, and was instructed to respond with a “correct” button to illuminate a yellow light in the employee’s room if the response was correct, or one of ten bogus “shock” buttons if the employee’s response was incorrect. Participants were told that, as supervisors, they would administer shocks to the employee to simulate “criticism” of job performance, as in a work situation. As in other studies [Verona et al., 2002], prior to the beginning of the procedure, a shock demonstration was conducted to enhance the credibility of the cover story. To control for individual differences in shock sensitivity, each participant was administered three electric shocks of increasing intensity and rated them for perceived aversiveness on a scale of 1 to 100 (“Not at all painful” to “Extremely painful”). The experimenter’s description as to which shock intensities corresponded to which shock levels on the shock box were calibrated to each participant’s ratings of these pre-test shocks.

*Cueing context.* Participants were randomly assigned to either a *stress-focused* (SF; 13 women, 12 men) or *confederate-focused* (CF; 13 women, 12 men) condition, and were told of condition assignment *after* the baseline assessments and instructions. There were no

significant differences between participants in the two conditions on any of the demographic variables. Participants in the SF condition were told that they would be providing feedback to the employee during “distraction” and were fitted with a small harness placed around their chests, from which brief, intermittent blasts of compressed air were administered to their throats [Grillon and Ameli, 1998; McManis et al., 1999; Verona et al., 2002]. To reduce the predictability of air blast presentations, these occurred within the trial period and during interstimulus periods. The serial position of air blasts was counterbalanced within blocks, and an equal number were presented during correct and incorrect response trials across blocks. Participants in the CF condition were told that they were in the control condition, and did not receive air blast administrations. At the end of the study, participants in the high-stress condition were asked to rate the aversiveness (from 1 = “not at all unpleasant” to 10 = “extremely unpleasant”) of air blasts administered to them during the procedure.

*Frustration procedures.* There were a total of six task blocks in the experiment, and each block consisted of ten trials. On about 50% of the trials, the “employee” responded incorrectly on the digit-span task, calling for a shock button response from the “supervisor”. The experimenter manipulated the employee’s responses so that he/she made a large number of errors during each block and across the whole experiment (29 total). After each block, all participants received feedback on their monitor screen as to the number of incorrect responses made by the employee during that block. This procedure ensured participants’ continuous investment in, and their focus on, the confederate’s performance, which would purportedly lead to more frustration directed at the confederate.

### Aggression/Hostility Measures

*Aggressive behavior.* Shock intensity (mean level of shock administered) and shock duration (length of time the shock button was pressed) were recorded as separate indices of aggressive behavior on “incorrect” trials. Shock intensity and shock duration responses were significantly correlated with each other ( $r = .49, P \leq .01$ ). Based on prior work [Bushman, 2002], and to establish a more reliable measure of aggression, the two behavioral measures were standardized using T-score transformations (i.e., a mean of 50 and an SD of 10) to convert them to the same metric. An average composite of these two measures was used as the dependent measure in analyses.

*Post-study evaluations.* Following the experiment, participants were administered a post-study questionnaire to assess their evaluation of the confederate [Verona et al., 2002; Lang et al., 1975]. One item asked participants to estimate how they would have performed on the digit memory task compared with the employee on a 1 (“a lot worse”) to 10 (“a lot better”) scale, and a second and third item asked them to rate their overall impression of the employee (1 = “extremely unfavorable” and 10 = “extremely favorable”) and their impression of the employee’s competence (1 = “definitely not competent” and 10 = “definitely competent”). Two other ten-point items (1 = “not at all” to 10 = “all the time”) assessed the extent to which participants felt they had either *instrumental motives* (“to encourage better performance in the employee”) or *hostile motives* (because they were “upset about the employee’s performance”) to increase shock intensities administered to the employee. These two latter measures gauged participants’ focus on and frustration about, respectively, the confederate’s performance.

## Post-Study Interview and Debriefing

Participants were interviewed post-experiment to determine the efficacy of the manipulations and veracity of the cover story and deception. An effort was made to assess suspicions regarding the true aim of the study. Three participants (two men and one woman) expressed suspicions and were excluded from the experiment and replaced. These participants did not differ on demographic variables from the participants who were kept in the sample. In addition, when these individuals were included in analyses, the results did not differ in any important respects from what is reported below. During scheduled debriefing sessions, participants were informed of the true purposes of the study and allowed to voice any concerns and ask questions.

## Data Analyses

The main analyses were performed to examine the dual aims of the study: (1) the effects of trait rumination and cueing context on hostile feelings, evaluations, and aggressive behavior, and (2) the examination of relationships between rumination, context, and aggression in men and women separately. For the first aim, separate regression analyses were conducted on the PANAS mood change scores, overall aggression scores, and the post-study evaluation items. Cueing context (*confederate-focused* vs. *stress-focused*), gender (*male* vs. *female*), and rumination (continuously measured RRQ-R scores) served as independent variables in these analyses. For the second aim, regression analyses, with context and rumination as predictors, were conducted separately by gender to examine a priori hypotheses regarding the differential effects of rumination and context on mood, aggression, and post-study evaluations for men and women. These separate gender analyses can be conducted, even when there is no significant interaction, if this is warranted by a priori hypotheses [Howell, 1992, p 394], particularly when a large literature supports gender differences in aggression and rumination [see Bettencourt and Miller, 1996; Nolen-Hoeksema, 1991]. For all analyses, simple effects were performed to follow up on significant interactions. When a significant interaction involved RRQ-R (a continuous variable) and one of the categorical variables (e.g., context or gender), the simple effects involved examining the significant prediction by RRQ-R for each level of the categorical variable [Aiken and West, 1991, pp 130–131], and the difference in the relationship between RRQ-R and the dependent variable for each level of the categorical variable [Tabachnick and Fidell, 1989, p 325].

## RESULTS

### Trait Measures

Differences between men and women and between participants in the two cueing contexts in trait anger/aggression and in rumination were examined using separate two-way Gender  $\times$  Context ANOVAs. In terms of the efficacy of random assignment to conditions, SF and CF participants did not differ significantly on the RRQ-R, or on any of the AQ or AX scales (see Table I). As expected, men reported more instances of physical aggression,  $F(1,36) = 11.83, P \leq .001$ , than women on the AQ, but there were no other gender differences on the AQ scales, RRQ-R, or AX (see Table I).

TABLE I. Means (SDs) for Trait Measures by Context and Gender

	Women		Men	
	Low stress <i>M</i> (SD)	High stress <i>M</i> (SD)	Low stress <i>M</i> (SD)	High stress <i>M</i> (SD)
RRQ-R ( <i>N</i> = 50)	26.4 (7.9)	32.2 (7.8)	34.8 (8.6)	30.3 (8.2)
AQ ( <i>N</i> = 48)				
Physical Aggression	14.7 (4.3)	15.0 (4.4)	20.7 (6.8)	21.0 (6.0)
Verbal Aggression	13.8 (2.2)	12.1 (4.8)	14.7 (5.7)	14.1 (2.8)
Anger	14.4 (4.6)	14.3 (3.7)	16.0 (4.5)	13.1 (3.5)
Hostility	18.3 (6.4)	16.1 (4.9)	20.9 (7.6)	15.8 (6.0)
AX ( <i>N</i> = 48)				
Anger In	16.9 (4.4)	15.2 (4.0)	17.3 (5.5)	16.8 (5.3)
Anger Out	15.8 (4.4)	16.3 (4.1)	15.7 (3.4)	16.9 (2.8)
Anger Control	9.9 (2.3)	8.7 (1.7)	9.2 (1.6)	10.0 (1.6)

Note: AQ = Aggression Questionnaire [Buss and Perry, 1992]; AX = Anger Expression Scale [Spielberger et al., 1985]. RRQ-R = Rumination Subscale of Reflection-Rumination Questionnaire [Trapnell and Campbell, 1999]. Standard deviations (SDs) are in parentheses.

### Manipulation Checks

As a demonstration of the validity of the aggression paradigm, overall aggression scores correlated significantly with AQ total ( $r = .27, P \leq .06$ ), with AQ Verbal Aggression ( $r = .50, P \leq .01$ ), AX Anger Out ( $r = .32, P \leq .05$ ), and negatively with AX Anger Control ( $r = -.30, P \leq .05$ ). To confirm that participants became frustrated due to the employee's poor performance, repeated-measures ANOVA block analyses revealed that participants showed a robust linear increase in aggression across blocks,  $F(1, 49) = 8.87, P \leq .01$ . Also, the post-study evaluations showed that participants' overall impression of the employee was somewhat unfavorable to neutral (median = 5.0), and they reported that they would have done better than the employee on the digit memory task, particularly men compared with women (medians = 6.5 vs. 5.0, respectively). In sum, these data suggest that participants were indeed frustrated by the employee's lack of progress on the task.

As a check on the efficacy of the stressor used in this experiment, participants in the high-stress condition rated the air blasts as "moderately" to "very" unpleasant. Men and women did not differ on their ratings of the unpleasantness of the air blasts ( $M$ 's = 5.75 and 6.15; SDs = 2.27 and 2.05).

### Self-Report Mood Changes

*Context effects.* Separate regression analyses, using context, gender, and RRQ-R as predictors, were conducted on changes (baseline–post-experiment) in mood on the different PANAS state scales. Analyses conducted on fear scores revealed a significant Context  $\times$  Rumination interaction,  $B = 2.08, t(41) = 5.02, P \leq .001$ . RRQ-R was a significant predictor of fear in the SF but not the CF condition,  $B$ 's = .41 and  $-.34, t(23) = 2.14$  and  $t(22) = -1.68, P$ 's = .04 and .11, respectively. As expected, rumination was predictive of increases in fear in the SF condition ( $r = .41$ ) and decreases in fear in the CF condition ( $r = -.11$ ). For sadness, analyses revealed a significant Context  $\times$  Rumination interaction,  $B = 2.05, t(41) = 4.76, P \leq .001$ . Although participants in the SF condition experienced

increases in sadness and those in the CF condition experienced decreases in sadness (change score  $M$ 's = .31 vs.  $-.68$ ), trait rumination predicted the greatest decreases in sadness during the CF condition relative to the SF condition,  $B$ 's =  $-.40$  and  $-.03$ ,  $t(22) = -2.05$  and  $t(23) = -.14$ ,  $P$ 's = .05 and .88, respectively. Analyses conducted on hostility scores revealed a significant Gender  $\times$  Rumination interaction,  $B = 1.89$ ,  $t(41) = 2.13$ ,  $P \leq .04$  (i.e., the relationship between rumination and hostility was significantly different for men and women). Rumination was negatively related to hostility in women ( $r = -.32$ ), but positively related to hostility in men ( $r = .16$ ). Context did not interact with these effects for hostility.

These analyses confirm that ruminative experiences enhance the impact of the particular context on mood states: participants, particularly if they scored high on rumination, experienced increases in fear and sadness in the SF context. A decrease in these internalizing feelings was experienced among participants in the CF condition. Hostility, however, was positively related to rumination for men and negatively related to rumination for women, regardless of context.

*Gender differences.* As per our second a priori aim, regression analyses, with context and RRQ-R scores as predictors, were conducted on mood scores separately by gender. Among women, there was a significant Context  $\times$  Rumination interaction for negative affect and fear,  $B$ 's = 2.01 and 2.26,  $t$ s (22) = 2.40 and 2.90, respectively,  $P$ 's  $\leq .05$ . Rumination significantly predicted increased fear in women in the SF condition, but was negatively and non-significantly related to fear for women in the CF context,  $B$ 's = .60 and  $-.42$ ,  $t$ 's (11) = 2.48 and  $-1.54$ ,  $p$ 's = .03 and .15, respectively. For men, rumination was unrelated to negative affect or fear in both conditions. Similar results were found for sadness: women showed a significant Context  $\times$  RRQ-R interaction,  $B = 1.62$ ,  $t(22) = 2.12$ ,  $P \leq .05$ , but men did not,  $B = -1.19$ ,  $t(21) = 1.41$ ,  $P > .10$ . Among women, rumination predicted decreases in sadness in the CF condition, but was positively and non-significantly related to sadness in the SF context,  $B$ 's =  $-.78$  and .10,  $t$ 's (11) =  $-4.13$  and .34,  $P$ 's = .01 and .74, respectively. These analyses suggest that rumination led to increases in internalizing feelings (fear and sadness) under stress exposure for women but not men.

## Aggressive Behavior

*Context effects.* We conducted regression analyses on the standardized overall aggression scores (see above), with context (CF vs. SF), gender (women vs. men), and RRQ-R as predictors. See Table II for a summary of these regression analyses. In terms of our first aim, the analyses revealed a significant Context  $\times$  Rumination interaction. As hypothesized, follow-up analyses revealed that rumination positively predicted greater levels of aggression in the CF group,  $B = .72$ ,  $t(23) = 5.00$ ,  $P \leq .001$ , but was unrelated to aggressive responding in the SF group,  $B = -.07$ ,  $t(23) = -.36$ ,  $P = .72$ . As illustrated in Figure 1, persons scoring high on rumination showed greater aggression in the CF context, presumably because ruminations were focused on the confederate's poor performance (and not on an external stressor), relative to the SF context.<sup>2</sup>

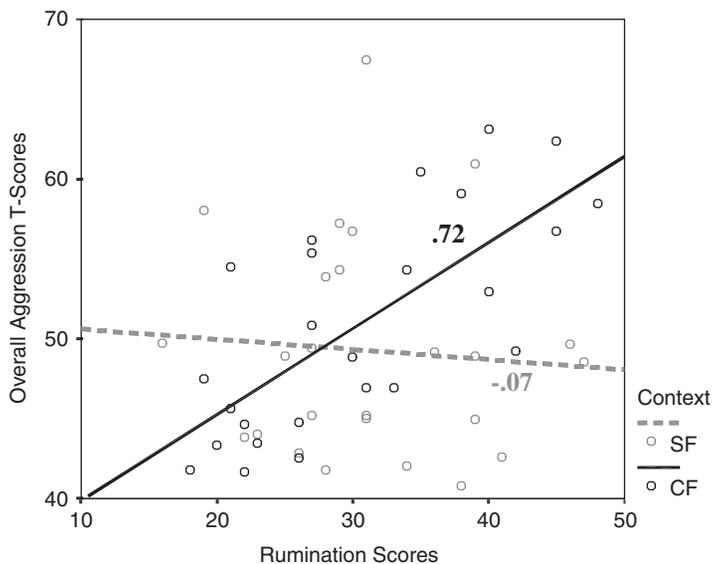
*Gender differences.* As per our second a priori aim, a Context  $\times$  Rumination analysis on aggression scores was conducted separately by gender. Despite the lack of a gender interaction in the above results, it was important to examine the effects of rumination and

<sup>2</sup>It should be noted that the Context  $\times$  Rumination interaction remained even when gender was not included in analyses.

**TABLE II. Results of Regression Analyses Predicting Aggression Scores, for the Overall Sample and for each Gender Separately**

	<i>B</i>	T-statistic	<i>P</i> -value
<u>Overall sample: Gender × Context × RRQ-R</u>			
Context	1.18	1.78	.08
Gender	-.21	-.32	.75
RRQ-R	.49	1.91	.06
Context × Gender	-.22	-.27	.79
<b>Context × RRQ-R</b>	<b>-1.49</b>	<b>-2.01</b>	<b>.04</b>
Gender × RRQ-R	.44	.59	.56
Context × Gender × RRQ-R	.45	.55	.59
<u>Women: Context × RRQ-R</u>			
<b>Context</b>	<b>1.60</b>	<b>2.15</b>	<b>.04</b>
<b>RRQ-R</b>	<b>.64</b>	<b>2.31</b>	<b>.03</b>
<b>Context × RRQ-R</b>	<b>-2.08</b>	<b>-2.51</b>	<b>.02</b>
<u>Men: Context × RRQ-R</u>			
Context	.88	1.11	.29
<b>RRQ-R</b>	<b>.67</b>	<b>2.44</b>	<b>.02</b>
Context × RRQ-R	-.89	-1.14	.27

Note: RRQ-R = Rumination subscale of Reflection-Rumination Questionnaire [Trapnell and Campbell, 1999]. The T-statistic is the test of the unique contribution of each predictor, controlling for other predictors in the model, to explaining variance in the dependent variable.



**Fig. 1. Differences in prediction of aggression from RRQ-R scores for confederate-focused (CF) and stress-focused (SF) groups.**

context separately by gender, given that the stressor seemed to have a greater effect on state mood among ruminating women than men (see the section titled “Self-Report Mood Changes” above). The Context × Rumination interaction was significant for women, but not

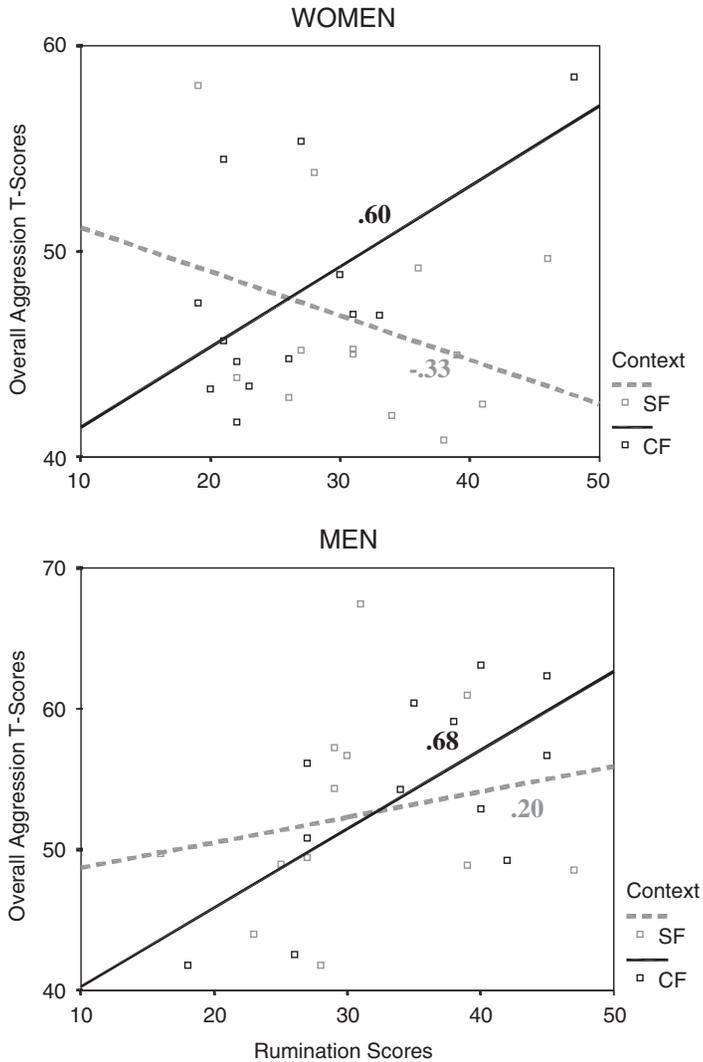


Fig. 2. Prediction of aggression as a function of RRQ-R scores and Context (CF vs. SF) among women (top panel) and men (bottom panel) separately.

for men (see Table II). Follow-up correlational analyses for women revealed that rumination was positively related to aggression in the CF condition,  $B = .60$ ,  $t(11) = 2.48$ ,  $P \leq .05$ , but negatively and non-significantly related to aggression in the SF condition,  $B = -.33$ ,  $t(11) = -1.18$ ,  $P > .2$ . For men, however, rumination predicted increases in aggression in both conditions (see Table II), but particularly under the CF condition (SF  $r = .68$  vs. CF  $r = .20$ ). Thus, high ruminating women administered stronger shock responses during the CF condition but inhibited shock responses during the SF condition (see Fig. 2, top panel). High ruminating men showed high levels of aggression across both cueing contexts (Fig. 2, bottom panel).

## Post-Study Evaluations

*Context effects.* Participants' responses to the post-study evaluation items were examined using a series of regression analyses, using the same predictors as in the above analyses. Significant results were only found for the two "motives" items. Analyses revealed a significant Context  $\times$  Rumination interaction for ratings of instrumental motives,  $B = -1.54$ ,  $t(42) = 1.94$ ,  $P \leq .05$ . Follow-up analyses revealed that rumination scores were positively related to instrumental motives for participants in the CF condition,  $B = .45$ ,  $t(23) = 2.43$ ,  $P \leq .02$ , whereas this relationship was negative and non-significant for participants in the SF group,  $B = -.14$ ,  $t(23) = -.68$ ,  $P = .50$ . Analyses on hostile motives yielded a significant main effect of rumination,  $B = .59$ ,  $t(42) = 2.72$ ,  $P \leq .01$ , signifying that increases in rumination tendencies were linked to more hostile motives toward the confederate. However, this relationship was significant for CF participants,  $r = .49$ ,  $P \leq .01$ , but not for SF participants,  $r = .12$ ,  $P = .58$ . As illustrated in Figure 3, participants scoring high on rumination were more likely to report more motives to increase shock intensities because they wanted to encourage better performance in the confederate (top panel) and because they were upset about the confederate's performance (bottom panel). However, these relationships were most robust during the CF condition.

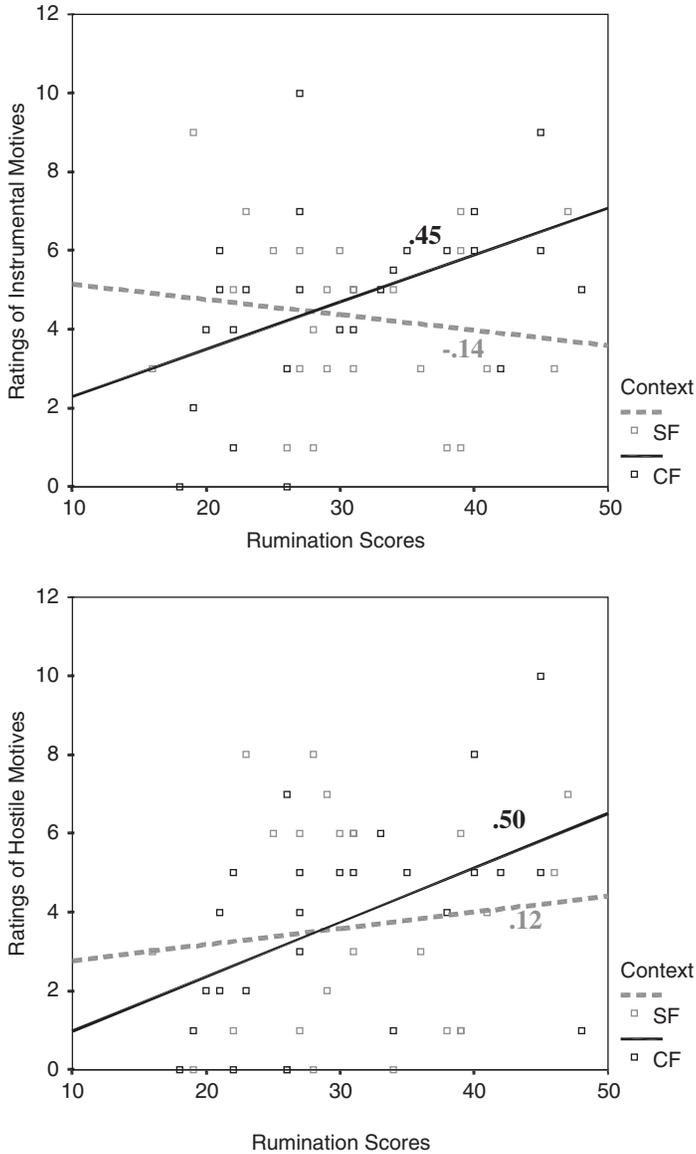
*Gender differences.* The analyses on the post-study evaluation items were conducted separately by gender. These analyses revealed that the Context  $\times$  Rumination interaction for instrumental motives was significant in women,  $B = -1.90$ ,  $t(22) = -2.30$ ,  $P \leq .05$ , but not in men,  $B = -.50$ ,  $t(21) = -.63$ ,  $P > .5$ . Rumination predicted *decreases* in instrumental motives for women in the SF group,  $B = -.56$ ,  $t(11) = -2.26$ ,  $P \leq .05$ , but predicted non-significant increases in instrumental motives for women in the CF group,  $B = .26$ ,  $t(11) = .88$ ,  $P = .40$ . As with the aggression variable, men showed positive relationships between rumination and instrumental motives in both conditions,  $B = .78$ ,  $t(20) = 2.87$ ,  $P \leq .01$ . No significant results were found for hostile motives for women. Among men, rumination predicted higher ratings of hostile motives,  $B = 4.70$ ,  $t(20) = 2.41$ ,  $P \leq .03$ ; but this relationship for men was much stronger in the CF than in the SF context,  $B$ 's = .72 and .07,  $t$ 's (10) = 3.32 and .22,  $P$ 's = .01 and .83, respectively.

## DISCUSSION

### Aim #1: Effects of Context and Rumination on Aggression

A main finding of this study is that tendencies toward general rumination, and not only trait anger or angry rumination, can lead to increased aggressive behavior when the salient aspect of the context is the negative interpersonal situation. In essence, trait rumination was related to increased aggression under a cueing context where the attention to and frustration toward the confederate's performance was not distracted. Evidence for this interpretation comes from data from the post-study evaluations: ruminating participants in the "confederate-focused" condition were more likely to endorse the fact that they were intent on encouraging better performance by the confederate and were upset at the confederate's poor performance, and thus they increased shock intensities in response to these motives.

In addition, analyses revealed that trait rumination related to increased apprehension, fear, and sadness for those in the "stress-focused" condition. In turn, potentially as a result of these emotional and cognitive responses to the physical stressor, rumination led to less



**Fig. 3.** Prediction of instrumental (top panel) and hostile (bottom panel) motives as a function of RRQ-R scores and Context (CF vs. SF).

aggression (particularly for women) in this cueing context relative to the confederate-focused condition. Together, these data confirm that among persons with ruminative tendencies, the theme of their cognitive perseveration will be consistent with the instigating context. Thus, rumination was related to increased negative attitudes and behaviors about the confederate in the confederate-focused condition, but to increased fear and behavioral inhibition in the stress-focused condition.

A connectionist model can help explain the effect of rumination and cueing context on emotion and behavior. Researchers [Morrow and Nolen-Hoeksema, 1990; Rusting and Nolen-Hoeksema, 1998; Davey, 1995] have suggested that a distressing event can activate negative emotions and the cognitive processing of memories, beliefs, and attributions consistent with that event, in line with the idea of spreading activation in a semantic network. This stream of negative cognitive activation, in turn, exacerbates, maintains, and prolongs the negative emotional state in response to that event. For high ruminators, this cognitive activation is not stemmed, and thus they experience the most prolonged and intense negative feelings following negative events. This perseverative thought activation would result in behaviors that are consistent with the emotional state and context: (a) behavioral and social withdrawal would result in the context of depressive ruminations, (b) fear and behavioral avoidance would result in the case of a fearful context and ruminations, and (c) aggression and hostile behaviors would result in the context of anger-related ruminations. In terms of the latter, angry rumination not only encourages behavior consistent with retaliatory thoughts but may also inhibit more rational problem solving and evaluation of future consequences [Kuhl and Baumann, 2000], and this inhibition of higher cortical mediation of behavior has been associated with an increase in the likelihood of aggressive behavior [Berkowitz, 1990; Giancola et al., 1998; see Davidson et al., 2000]. However, before there can be further theoretical formulation of the rumination–aggression relationship, important gender differences, which were evident in the current data, need to be discussed.

## **Aim #2: Moderating Role of Gender**

The results suggested that trait rumination was more likely to enhance the experience of the cueing context in women than men. In the stress-focused condition, the effect of rumination on fear and sadness in response to the stressor was particularly robust for women; however, in the confederate-focused condition, rumination in women was associated with *decreases* in these internalizing feelings and *increases* in aggression and aggression-related motives. In contrast, context effects were more modest among ruminating men: rumination related to more externalizing feelings (hostility), behaviors (aggression), and motives (instrumental and hostile) in men across both conditions. These results are interesting in that they may suggest that women, particularly those with tendencies toward rumination, are more emotionally affected by contextual cues. In addition, their thought processes are more influenced by context; thus, their emotional responses and behaviors will be more variable across situations. Although high ruminative women showed more aggression in the confederate-focused condition, they actually showed an *inhibition* of aggression in the stress-focused condition (because this behavior was inconsistent with the experience of fear and sadness and concomitant thoughts).

In contrast, perhaps due to strong socialization experiences that have reinforced more hostile and aggressive responses in men, negative cognitive activation under frustrating interpersonal circumstances are more easily and naturally activated in men, particularly for those who are prone to ruminate about the situation. In support of this supposition, trait rumination in men related to increases in feelings of hostility during the experiment across both contexts; thus, we can hypothesize that ruminative men focused on the confederate's poor performance under both conditions. Frodi [1978] observed something similar in that, among men, the opportunity to ruminate led to prolonged physiological arousal in provocation and no provocation conditions. In the current study, men seemed to continue to

focus on the negative aspects of the interpersonal situation and make hostile attributions of the confederate, albeit less so than under instigating conditions, despite fearful distractions. The data presented are of course preliminary, and they require replication. It may have been that men were less fearful of the stressor than women, and thus the stressor was less distracting for them. However, women and men both rated the air blasts as equally aversive. More research needs to be conducted to confirm that rumination in men and women produces differential emotional and behavioral responses across contexts.

### **Limitations and Conclusions**

It is important to acknowledge potential limitations of the aggression paradigm used in this study. These include inherent weaknesses in ecological validity. However, laboratory measurement provides a unique opportunity to directly test the effects of tightly controlled contexts on emotional and behavioral responding; thus, these measures seemed warranted, particularly since prior studies have confirmed their validity [Hynan and Grush, 1996; Berkowitz and Alioto, 1973]. Another criticism of laboratory aggression paradigms involves the possibility that the shock responses of participants in this situation might reflect altruism (i.e., desire to aid the confederate) more so than aggression [Baron and Eggleston, 1972; Tedeschi and Quigley, 1996; Giancola and Chermack, 1998]. However, the cover story used was less likely to allow participants to interpret their behaviors as altruistic. Participants were told that, as supervisors, they would administer shocks to the employee to simulate “criticism” and negative feedback of job performance. Debriefing interviews confirmed this, and the finding that shock responses correlated with trait anger and aggression is inconsistent with an altruistic interpretation. Nonetheless, in future replications, researchers may choose to use laboratory measures that can be unambiguously interpreted as aggressive [e.g., hot-sauce allocation; Lieberman et al., 1999].

Another limitation of the study is that the confederate (and target of aggression) was the same sex as the participants administering shocks, potentially complicating the interpretation of main effects of gender on aggression. We introduced participants to confederates of the same gender to avoid potential cross-gender complications and difficult-to-interpret interactions [Frodi, 1978]. However, future research can involve fully counterbalancing sex of participant and confederate in the same experiment to confirm that gender differences in the rumination–aggression link remain across target genders. In addition, a provocation condition was not included in this experiment because the focus was on the effect of rumination and context on unprovoked aggression. However, an extension of this work would be to include a provocation condition in the experiment to show whether such a condition, compared with a stress condition, would have more robust effects on the rumination–aggression link in men than in women. Importantly, future studies should also involve manipulation of rumination to confirm the *causal* effects of rumination and distraction on mood, thoughts, and aggression [Nolen-Hoeksema and Morrow, 1991; Bushman, 2002; Frodi, 1978]. Replication of the current findings is particularly important in the light of the fact that the sample size for this study was somewhat small ( $N = 50$ ), and this may create problems in detecting higher-order interaction effects.

Despite these limitations, the results from this study have important implications for treatment development and violence prevention. To prevent negative responses to stress or provocation, individuals with tendencies toward rumination can be targeted in treatment programs that teach them to use different cognitive strategies in dealing with negative events.

This would aid in decreasing negative emotions of all kinds, including depression, anxiety, and anger, in these individuals, and would prevent aggressive acts among those more likely to harbor thoughts of revenge and resentment against past provocateurs.

## REFERENCES

- Aiken LS, West SG. 1991. Multiple regression: Testing and interpreting interactions. Thousand, Oaks, CA: Sage Publications, Inc.
- Baron RA, Eggleston RJ. 1972. Performance on the "aggression machine": Motivation to help or harm? *Psychonomic Science* 26:321-322.
- Berkowitz L, Alioto JT. 1973. The meaning of an observed event as a determinant of its aggressive consequences. *Journal of Personality and Social Psychology* 28:206-217.
- Berkowitz L. 1990. On the formation and regulation of anger and aggression: A cognitive-neoassociationistic analysis. *American Psychologist* 45: 494-503.
- Bettencourt BA, Miller N. 1996. Gender differences in aggression as a function of provocation: A meta-analysis. *Psychological Bulletin* 119:422-447.
- Bushman BJ. 2002. Does venting anger feed or extinguish the flame? Catharsis, rumination, distraction, anger, and aggressive responding. *Personality and Social Psychology Bulletin* 28:724-731.
- Buss AH, Perry M. 1992. The Aggression Questionnaire. *Journal of Personality and Social Psychology* 63: 452-459.
- Caprara GV. 1986. Indicators of aggression: The dissipation-rumination scale. *Personality and Individual Differences* 7:763-769.
- Caprara GV, Coluzzi M, Mazzotti E, Renzi P, Zelli A. 1985. Effects of insult and dissipation-rumination on delayed aggression and hostility. *Archives of Psychology, Neurology, and Psychiatry* 46:130-139.
- Caprara GV, Gargaro T, Pastorelli C, Prezza M. 1987. Individual differences and measures of aggression in laboratory studies. *Personality and Individual Differences* 8:885-893.
- Clark LA, Watson, D. 1991. Tripartite model of anxiety and depression. Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology* 100:316-336.
- Collins K, Bell R. 1997. Personality and aggression: The dissipation-rumination scale. *Personality and Individual Differences* 22:751-755.
- Davey GCL. 1995. Rumination and the enhancement of fear: Some laboratory findings. *Behavioural and Cognitive Psychotherapy* 23:203-215.
- Davidson RJ, Putnam KM, Larson CL. 2000. Dysfunction in the neural circuitry of emotion regulation—a possible prelude to violence. *Science* 289: 591-594.
- Eagly AH, Steffen VJ. 1986. Gender and aggressive behavior: A meta-analytic review of the social psychological literature. *Psychological Bulletin* 100: 309-330.
- Frodi A. 1978. Experiential and physiological responses associated with anger and aggression in women and men. *Journal of Research in Personality* 12: 335-349.
- Giancola PR, Chermack ST. 1998. Construct validity of laboratory aggression paradigms: A response to Tedeschi and Quigley 1996. *Aggression and Violent Behavior* 3:237-253.
- Giancola PR, Mezzich AC, Tarter RE. 1998. Executive cognitive functioning, temperament, and antisocial behavior in conduct-disordered adolescent females. *Journal of Abnormal Psychology* 107:629-641.
- Goldstein JH, Davis RW, Herman D. 1975. Escalation of aggression: Experimental studies. *Journal of Personality and Social Psychology* 31:162-170.
- Grillon C, Ameli R. 1998. Effects of threat and safety signals on startle during anticipation of aversive shocks, sounds, or airblasts. *Journal of Psychophysiology* 12:329-337.
- Howell DC. 1992. "Statistical Methods for Psychology," 3rd edition. Boston: PWS-Kent Publishing Co.
- Hynan DJ, Grush JE. 1986. Effects of impulsivity, depression, provocation, and time on aggressive behavior. *Journal of Research in Personality* 20: 158-171.
- Konecni V. 1974. Self-arousal, dissipation of anger, and aggression. *Personality and Social Psychology Bulletin* 1:192-194.
- Knight RG, Chisholm BJ, Paulin JM, Waal-Manning HJ. 1988. The Spielberger Anger Expression Scale: Some psychometric data. *British Journal of Clinical Psychology* 27:279-281.
- Kring AM, Gordon AH. 1998. Sex differences in emotion: Expression, experience, and physiology. *Journal of Personality and Social Psychology* 74: 686-703.
- Kuhl J, Baumann N. 2000. Self-regulation and rumination: Negative affect and impaired self-accessibility. In Parig WJ, Grob A (eds): "Control of Human Behavior, Mental Processes, and Consciousness: Essays in Honor of the 60th Birthday of August

- Flammer," Mahwah, NJ: Lawrence Erlbaum Associates, Inc., pp 283–305.
- Lang AR, Goeckner D, Adesso V, Marlatt G. 1975. Effects of alcohol on aggression in male social drinkers. *Journal of Abnormal Psychology* 84:508–518.
- Lieberman JD, Solomon S, Greenberg J, McGregor HA. 1999. A hot new way to measure aggression: Hot sauce allocation. *Aggressive Behavior* 25:331–348.
- McManis MH, Kagan J, Snidman N. 1999. Temperamental influences on affective modulation of the startle reflex in children. *Psychophysiology* 36:S79.
- Morrow J, Nolen-Hoeksema S. 1990. Effects of responses to depression on the remediation of depressive affect. *Journal of Personality and Social Psychology* 58:519–527.
- Nolen-Hoeksema S. 1991. Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology* 100: 569–582.
- Nolen-Hoeksema S, Jackson B. 2001. Mediators of the gender difference in rumination. *Psychology of Women Quarterly* 25:37–47.
- Nolen-Hoeksema S, Larson J, Grayson C. 1999. Explaining the gender differences in depressive symptoms. *Journal of Personality and Social Psychology* 77:1061–1072.
- Nolen-Hoeksema S, Morrow J. 1991. A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology* 61:115–121.
- Rusting CL, Nolen-Hoeksema S. 1998. Regulating responses to anger: Effects of rumination and distraction on angry mood. *Journal of Personality and Social Psychology* 74:790–803.
- Spielberger CD, Jacobs G, Russell S, Crane RS, Jacobs GA, Worden TJ. 1985. The experience and expression of anger: Construction and validation of an anger expression scale. In Chesney MA, Rosenman RH (eds): "Anger and Hostility in Cardiovascular and Behavioral Disorders," New York: Hemisphere, pp 5–30.
- Spielberger CD, Sydeman SJ. 1994. State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In Maruish ME (ed): "The Use of Psychological Tests for Treatment Planning and Outcome Assessment," Hillsdale, NJ: LEA, pp 292–321.
- Sukhodolsky DG, Golub A, Cromwell EN. 2001. Development and validation of the anger rumination scale. *Personality and Individual Differences* 31: 689–700.
- Tabachnick BG, Fidell LS. 1989. "Using Multivariate Statistics." New York: Harper Collins.
- Tedeschi JT, Quigley BM. 1996. Limitations of laboratory paradigms for studying aggression. *Aggression and Violent Behavior* 1:163–177.
- Thompson RJ, Kolstoe RH. 1974. Physical aggression as a function of strength of frustration and instrumentality of aggression. *Journal of Research in Personality* 7:314–323.
- Trapnell PD, Campbell JD. 1999. Private self-consciousness and the five-factor model of personality: Distinguishing rumination from reflection. *Journal of Personality and Social Psychology* 76: 284–304.
- Verona E, Patrick CJ, Lang AR. 2002. A direct assessment of the role of state and trait negative emotion in aggressive behavior. *Journal of Abnormal Psychology* 111:249–258.
- Watson D, Clark LA, Tellegen A. 1988. Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology* 54:1063–1070.