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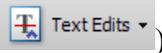
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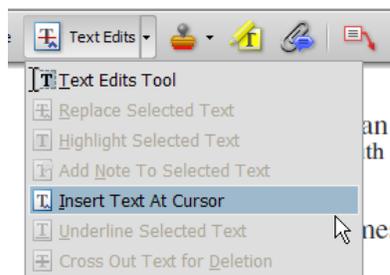
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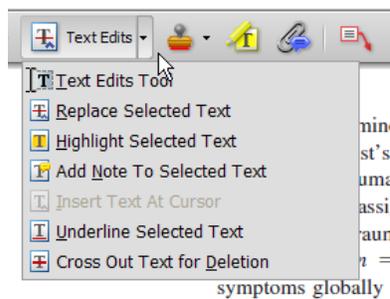
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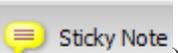
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Experiment 4: Comparative Optimism as a Function of Self-Presentation and Event Valence

	Event					
	Positive		Negative		Total	
Self-presentation	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Public/student	3.46	0.13	3.60	0.10	3.53	0.12
Public/expert	2.66	0.12	2.78	0.13	2.73	0.13
Control	2.39	0.11	2.46	0.09	2.43	0.11
Total	2.84	0.47	2.95	0.50		

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$$du/u = -\lambda dt$$

$$u_t = ue^{-\lambda t}$$

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Associative and Spontaneous Appraisal Processes Independently Contribute to Anger Elicitation in Daily Life

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There has been a great deal of debate concerning the antecedents of anger, with appraisal theorists emphasizing the role of hostile interpretations and cognitive neo-associationistic theorists emphasizing the role of more basic associative processes. Recently, theorists have sought to reconcile these views by acknowledging the role of both associative and inferential processes, and the current investigation drew upon recent social–cognitive research to test this compromise. Individual differences in hostile inferences and associations were assessed in an implicit cognitive paradigm, and relevant outcomes were assessed in a daily diary protocol. Implicit hostile inferences predicted both anger and aggression in daily life, and such relationships were mediated by propensities toward hostile interpretations in daily life. Hostile associations also predicted anger in daily life, but this relationship proved to be independent of daily hostile interpretations. Results therefore support a model that acknowledges the role of both associative and appraisal processes in anger elicitation.

Keywords: anger, aggression, spontaneous trait inferences, appraisal, associations

“Anger is never without a reason, but seldom is it with a good one.”—Benjamin Franklin

Benjamin Franklin’s quote highlights an important source of tension in anger-related theorizing. On the one hand, it seems readily apparent that people become angry for very specific reasons. They perceive offensive or provoking behavior in others and mobilize themselves to respond in kind (e.g., Smith & Kirby, 2001, 2004). Despite such observations, some have suggested that anger’s reasons are often less than logical (e.g., Baumeister, Stillwell, & Wotman, 1990) and may even be post hoc justifications designed to explain the emotion of anger (e.g., Haidt, 2001; Frijda, 1993).

This tension is reflected in an important debate in the psychological literature. On the one hand, appraisal and attribution theorists¹ (e.g., Crick & Dodge, 1994; Smith & Lazarus, 1993; Weiner, 1986) have long argued that anger is the result of viewing another person as intentionally trying to harm one’s self. Studies using hypothetical vignettes (Epps & Kendall, 1995; Graham, Hudley, & Williams, 1992; Smith, Haynes, Lazarus, & Pope, 1993), autobiographical recall (Roseman, Wiest, & Swartz, 1994; Smith et al., 1993), videos (Dill, Anderson, & Anderson, 1997; Hazebroek, Howells, & Day, 2001), daily diary protocols (Nezlek,

Vanstellandt, Machelen, & Kuppens, 2008), experimental manipulations (Graham & Hudley, 1994; Meier & Robinson, 2004; Neumann, 2000), and clinical interventions (Hudley & Graham, 1993) have all supported this contention. State anger increases after hostile interpretations of situations (e.g., Smith et al., 1993), and trait anger increases as a function of stable biases toward hostile interpretations (e.g., Dodge, 1980; see Wilkowski & Robinson, 2008, for a review).

In contrast to these theories, Cognitive Neo-Associationistic (CNA) theorists argue that hostile interpretations are not necessary for the elicitation of anger (Berkowitz, 1990, 1993; Berkowitz & Harmon-Jones, 2004a). Instead, they suggest that aversive circumstances need only activate associated hostile thoughts and action tendencies in memory for anger to be elicited. Consistent with this view, obstacles to goal attainment can elicit anger and aggression even when they are viewed as completely justified and legitimate (Berkowitz, 1989; Dill & Anderson, 1995). Likewise, heat and pain can elicit anger and aggression in the apparent absence of hostile interpretations (e.g., Anderson, 2001; Lindsay & Anderson, 2000), presumably because they activate hostile thoughts through a lower-order spreading activation process (e.g., Rule, Taylor, & Dobbs, 1987).

In summary, there has been a long history of debate and opposition between appraisal or attribution theorists and CNA theorists (Berkowitz & Harmon-Jones, 2004a; Roseman, 2004; Smith &

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¹ There is a subtle difference between appraisals and attributions, with attributions referring to an objective assessment of one’s situational context and appraisals referring to a more subjective assessment of how the situation impacts one’s goal pursuit (Smith et al., 1993). It is not the purpose of the current investigation to determine whether appraisals or attributions are more directly involved in anger elicitation, and thus we use the more theory-neutral terms *interpretation* and *inference* to describe this construct in this article.

Kirby, 2004). Despite this history, though, there have been some recent indications of an emerging compromise. The purpose of the current investigation is to empirically test certain aspects of this emerging compromise, while also resolving certain ambiguities therein.

Toward a Theoretical Integration

Despite many substantive differences that remain between theories, there have been several recent overtures toward a theoretical integration. Both sets of theorists ultimately acknowledge that multiple processes contribute to anger elicitation. CNA theorists suggest that although hostile interpretations are not necessary for anger elicitation, they may nonetheless give rise to anger at later stages of information processing (Berkowitz, 1990; Berkowitz & Harmon-Jones, 2004b). Likewise, appraisal or attribution theorists have begun to emphasize more automatic cognitive processes, suggesting that anger can be elicited through automatically generated hostile interpretations (Arnold, 1960; Ekman, 1999; Kappas, 2006). Even more consistent with CNA theory, some appraisal theorists have even suggested that the activation of hostile interpretations through associative processes may be sufficient to elicit anger (Smith & Kirby, 2004).

However, empirical demonstrations that associative and automatic inferential processes contribute to anger elicitation remain sparse. Moreover, despite the progress toward a theoretical integration, disputes remain regarding the exact cognitive processes involved in anger elicitation. Although appraisal or attribution theorists continue to assert that hostile interpretations must be activated in some way (whether it be through automatic or controlled processes) for anger to be elicited (e.g., Smith & Kirby, 2004), CNA theorists continue to assert that a wider variety of associative processes contribute to anger elicitation (Berkowitz & Harmon-Jones, 2004b). To more fully explore the precise processes involved in anger elicitation in a theoretically and empirically rigorous fashion, we drew upon a recent model emerging from the automatic person perception literature (Carlston & Skowronski, 2005; Crawford, Skowronski, Stiff, & Scherer, 2007). As detailed next, this model has made a clear distinction between associative and automatic inferential processes, a distinction that we believe has great promise for understanding the antecedents of anger.

Associative and Inferential Processes in Person Perception

Recent research on person perception has clearly demonstrated that interpersonal inferences do occur automatically (Carlston & Skowronski, 1994; Todorov & Uleman, 2002). Moreover, both early associative and later inferential process are seen as contributing in this regard (Carlston & Skowronski, 2005; Crawford et al., 2007). Early associative processes are revealed by tendencies to associate traits with previously encountered individuals despite no rational basis for doing so (Carlston, Skowronski, & Sparks, 1995; Crawford et al., 2007; Skowronski, Carlston, Mae, & Crawford, 1998). For example, when participants encounter a communicator describing the hostile behavior of a separate actor (e.g., Mary describing John's hostile behavior), participants automatically associate the communicator with traits implied by their description (e.g., associate Mary with the trait of hostility). Far from being the

product of rule-based reasoning, this *transference* process has been shown to be the result of a lower-order associative process more akin to conditioning (Brown & Bassili, 2002; Skowronski et al., 1998; Uleman, Saribay, & Gonzalez, 2008).

Beyond these nonrational associative processes, the person perception literature has also isolated subsequent inferential processes that operate according to rule-based principles. These inferential processes operate only when there is a logical reason for believing that a trait actually belongs to an individual. When a person describes their own behavior (e.g., when John describes his own hostile behaviors), inferential processes strengthen previously formed associations linking the person to a hostile trait. Because additional processing is involved in such instances, spontaneous trait inferences are more robust than trait transferences (Carlston & Skowronski, 2005; Carlston et al., 1995; Skowronski et al., 1998). Moreover, undermining the legitimate basis for an attribution reduces spontaneous inferences (Carlston & Skowronski, 2005; Crawford et al., 2007), whereas spontaneous transferences continue unabated even in relation to inanimate objects (Brown & Bassili, 2002).

The Current Investigation

Based upon a recent model emerging from the automatic person perception literature (Carlston & Skowronski, 2005), we propose that hostile interpretations can be produced automatically and that they are the joint result of early associative and later inferential processes.² Moreover, we propose that later inferential processes produce full-fledged interpretations, but that early associative biases represent a preappraisal process that should exhibit no direct relationship with conscious hostile interpretations. Fn2

The current investigation was designed to provide an initial test of this model by relating individual differences in both processes to anger elicitation and aggression in daily life. We first assessed individual differences in hostile associative and inferential processes using a false memory paradigm modeled after Todorov and Uleman (2002). We then used these implicit cognitive measures to predict the magnitude of anger and aggression participants reported in a subsequent daily diary protocol.

Consistent with CNA theory (Berkowitz, 1990, 1993), it was expected that hostile transferences would be positively related to daily levels of anger and aggression, and that these relationships would be independent of self-reported hostile interpretations in daily life. Consistent with classic versions of appraisal or attribution theories (e.g., Crick & Dodge, 1994; Weiner, 1986), it was expected that implicit hostile inferences would display a unique and independent relationship with daily anger and aggressive behavior. These latter effects were expected to be specifically mediated by hostile interpretations reported in daily life. Thus, both associative and appraisal-like processes were expected to contribute to anger elicitation, but via different routes.

² Consistent with the spontaneous attribution literature (Carlston & Skowronski, 2005), we use the term "inferences" or "inferential processing" to refer to the latter, rule-based process described in these theories. For our current purposes, we distinguish this from *interpretations*, which are defined as the consciously reported product of this spontaneous inferential process as well as other potential cognitive processes not directly assessed in this investigation.

Method

Participants

Fifty-two undergraduate psychology students (34 women, 18 men; M age = 19.5) participated in exchange for extra credit.

Apparatus

All participants completed the initial laboratory session on one of six Windows-based computers, using E-Prime software (version 1.2). Participants completed the subsequent daily diary protocol using SONA Internet software.

Measuring Hostile Transferences and Inferences: A False Memory Paradigm

Background. This task was modeled after Todorov and Uleman's (2002) false memory paradigm. In this paradigm, participants are first asked to study a series of faces paired with behavioral descriptions (e.g., "I provoked the man into a fistfight") for a later memory test. Even though no trait terms are explicitly mentioned during the critical sentences, participants have a spontaneous tendency to attribute implied traits to the depicted individual (e.g., that he is "hostile"). This is demonstrated in participants' subsequent pattern of false memories. In this later phase of the paradigm, participants are presented with face-word pairs, and asked to indicate whether the person described him or herself using a particular trait word. Critically, the presented trait terms were sometimes implied (but never explicitly stated) by the person's prior behavioral description (e.g., that he is "hostile"). Participants tend to falsely recognize these person-word pairs (i.e., indicate the person described him or herself using the word, "hostile") at higher levels than a control condition in which the same trait-terms are randomly paired with different faces (Todorov & Uleman, 2002). Such a pattern of results indicates that participants not only spontaneously infer trait terms while reading behavioral descriptions, but that they also bind these traits to concurrently presented faces.

Current task parameters and stimuli. We adopted Todorov and Uleman's (2002) basic procedures and paradigm to assess individual differences in spontaneous hostile transferences and inferences. Of further importance, we did so using behavioral descriptions that were ambiguously hostile in nature, as individual differences in hostile inferences are especially apparent when hostile intent is ambiguous (Dodge, 1980; Epps & Kendall, 1995). Eighteen ambiguously hostile target sentences were adapted from prior relevant investigations (Caldwell & Newman, 2005; Copello & Tata, 1990; Wingrove & Bond, 2005; Zelli, Cervone, & Huesmann, 1996; Zelli, Huesmann, & Cervone, 1995). These sentences (e.g., "Brandon started screaming when the athletes ran by") could potentially imply either a hostile trait (e.g., Brandon is "insulting") or a nonhostile trait (e.g., Brandon is "excitable"). To ensure that any obtained effects were specific to hostility, nonhostile as well as hostile inferences and transferences were assessed in this task.

To allow for the measurement of both transference and inference processes, two versions of each behavioral description were developed. In one version of the present materials, the behavioral description referred to the depicted individual (e.g., "I started screaming when the athletes ran by"). Later tendencies to falsely indicate that this person described him or herself as an "insulting"

person would provide implicit evidence of a hostile inference. In another version of the materials, the behavioral description referred to a separate individual (e.g., "Brandon started screaming when the athletes ran by"). To make it clear that these sentences did not refer to the depicted individual, the gender of the pictured individual was always opposite of the person described in the sentence (e.g., a female face would describe Brandon screaming) (Carlston et al., 1995). Later tendencies to falsely indicate that such a depicted person described him or herself as "insulting" would provide implicit evidence of a hostile transference.

To ensure that participants believed some of the sentences explicitly mentioned trait terms, 36 sentences were included that explicitly mentioned a trait term. To further ensure that participants believed some of the depicted individuals actually mentioned a hostile trait term, nine of these sentences explicitly mentioned a hostile trait. Eighteen control sentences were designed to imply nothing whatsoever regarding the depicted person's personality (e.g., "I replaced the burnt light bulb"). These sentences were mostly inconsequential in and of themselves, and were only included to introduce the control faces during the initial encoding phase. Both the explicit-trait sentences and trait-irrelevant sentences were adapted from a prior investigation (Todorov, Gobbini, Evans, & Haxby, 2007). Seventy-two faces (36 men, 36 women) displaying a neutral expression were downloaded from the AR Face Database (Martinez & Benavente, 1998) for use in this task.

Trial procedures. During the initial encoding phase, participants were asked to study 72 face and sentence pairs for a later, vaguely described memory test. This included all 18 target sentences, 18 trait-irrelevant sentences, and 36 explicit-trait sentences described above. Orthogonal to this factor, 36 sentences were self-referent in nature (referring to "I"), and 36 sentences were other-referent in nature (referring to an opposite sex individual). Face and sentence pairs were presented for 5 s, and there was a 1-s interstimulus interval.

During the subsequent recognition memory test, participants were asked to indicate whether each stimulus person described him or herself using a presented trait term (1 = yes; 0 = no). Both the hostile and nonhostile traits implied by the target sentences were presented twice, once with their previously paired face and once with a random control face. Such procedures allowed us to determine whether implied traits were specifically bound to the previously presented individual (Todorov & Uleman, 2002). To ensure that participants believed some of the traits presented during this recognition phase were present during the initial exposure phase, 18 of the explicitly mentioned traits were also presented with the same face as before. Trait and face pairs remained on screen until the participant responded, and there was a 500-ms pause between recognition memory trials.

Participants were randomly assigned to one of eight stimulus lists, which paired faces with appropriate sentences and trait terms in both the encoding and recognition phases. These lists achieved all the necessary constraints on stimulus presentation and were fully counterbalanced in nature. During both the exposure and recognition phases of the task, the computer generated a random stimulus presentation sequence for each participant.

Normative patterns. An initial normative analysis of the false memory task indicated that trait terms were falsely recognized at a higher rate when presented with their previously paired face ($M = 41.2\%$) relative to a random control face ($M = 38.6\%$), $F(1, 51) =$

4.11, $p = .04$. Thus, there was an overall tendency to bind implied trait terms to concurrently presented faces (Todorov & Uleman, 2002). Typically, this pattern is stronger for self-descriptions (referencing "I") relative to descriptions of other individuals (e.g., referencing "Brandon") (Carlston & Skowronski, 2005). Indeed, this effect was more pronounced for self-descriptions (M Diff = 3.5%) than for other-descriptions (M Diff = 1.6%), although the relevant interaction did not reach significance, $p > .10$. Although the decreased robustness of normative results is to be expected, considering the use of ambiguous behavioral descriptions in the current study, such results are nonetheless quite consistent with research in the spontaneous inference literature (e.g., Carlston & Skowronski, 2005).

Calculating individual difference measures. In total, four individual difference measures were derived from the false memory task: hostile transferences, nonhostile transferences, hostile inferences, and nonhostile inferences. Both the hostile and the nonhostile transference measures were mainly based on the number of false memories exhibited when other-descriptions were involved (e.g., a female face described Brandon's potentially insulting behavior) and pictured individuals were held constant across encoding and recognition phases (e.g., the same female face was presented across phases). However, it was necessary to ensure that the implied trait was bound to the originally presented face (Todorov & Uleman, 2002). Therefore, we sought to control for more diffuse false memories exhibited when the same implied trait (e.g., "insulting") was paired with a random control face.

As such, we calculated residual scores using regression-based procedures (Cohen, Cohen, West, & Aiken, 2003). This technique yields scores that remain highly correlated with the original variable of interest, but that are necessarily uncorrelated with any control variables entered therein. For both the hostile and nonhostile transference measures, we entered false memories in the other-description/random-face (OR) condition as a predictor of false memories in the other-description/previous-face (OP) condition in a linear regression. Transference scores (T) were then calculated through the equation, $T = OP - (b_0 + b_1OR)$, where T, OP, and OR are defined as above, b_0 represents the intercept of the obtained regression equation, and b_1 represents the obtained regression coefficient for OR false memories.

The inference measures were mainly based on the number of false memories exhibited when self-descriptions were involved (e.g., John described his own hostile behavior) and pictured individuals were held constant across encoding and recognition phases of the study (e.g., the same male face was presented across phases). As we did for the transference measures, we calculated residual scores that controlled for false memories not bound to the original actor's face. Of further importance, it has been demonstrated that associative processes contribute to spontaneous trait inferences as well as transferences (Carlston & Skowronski, 2005; Crawford et al., 2007). To create a process-pure measurement of inferential processing, it was necessary to control for transference tendencies as well. For both hostile and nonhostile inferences, we entered false memories in the description/random-face condition (SR) and in the OP condition as predictors of false memories in the self-description/previous-face (SP) condition in a multiple regression. Inferences (I) were calculated through the equation $I = SP - (b_0 + b_1SR + b_2OP)$, where I, SP, SR, and OP are defined as above, b_0 represents the

intercept of the obtained regression equation, and b_1 and b_2 reflect the obtained regression coefficients for SR and OP, respectively (Cohen et al., 2003).

Daily Diary Protocol

For 3 weeks after the initial assessment session, participants were asked to log on to an Internet website between the hours of 8 p.m. and midnight to complete a brief daily survey. This survey asked questions regarding three separate domains: the participant's daily mood, behaviors, and situational interpretations. With regard to mood, the hostility subscale of the Positive Affect and Negative Affect Scales—Expanded form (PANAS-X; Watson & Clark, 1994) was administered (items: angry, hostile, irritable, scornful, disgusted, loathing). Participants indicated how strongly they felt each mood state on the day in question, using a 1 (*not at all*) to 5 (*extremely*) response format. This scale proved to be highly reliable in the current study ($\alpha = .91$ across items; $\alpha = .96$ across days).

Participants were also asked to report on aggressive behaviors they performed on the day in question. They were specifically asked whether they argued with someone, ignored someone, insulted someone, criticized someone, hurt someone's feelings, threatened someone, spread rumors about someone, or gave someone a mean glance. They indicated how frequently they engaged in each of these behaviors on a given day, using a 0 (*not at all*) to 3 (*more than twice*) response format. These items were adapted from prior daily diary studies (Meier & Robinson, 2004; Moskowitz, 1994), and the scale proved to be highly reliable in the current dataset ($\alpha = .92$ across items; $\alpha = .89$ across days).

Finally, participants were asked to report on their interpretation of situations they encountered in a given day. Because interpretations are measured differently across different appraisal and attribution theories, we sought to measure hostile interpretations in two separate fashions. First, participants were asked about anger's core appraisal theme of *other blame* (Smith & Lazarus, 1993). They were specifically asked to indicate the number of times they "blamed someone," or "found fault with someone's behavior" on a given day ($r = .65$ across items; $\alpha = .92$ across days). Second, participants were asked about various forms of interpersonal provocation they may have perceived on a given day, such as whether someone criticized them, ignored them, was unfair to them, embarrassed them, or argued with them ($\alpha = .92$ across items; $\alpha = .83$ across days). These items were adapted from a prior study of provocation in daily life (Moskowitz, 1994). For both of the daily hostile interpretation scales, participants indicated how often each event occurred on a given day, using a 0 (*not a single time*) to 2 (*more than once*) response format.

To ensure high-quality data, the daily reports were closely screened before analysis. Occasions in which the participant completed multiple reports in a single day were excluded from analysis. After making such deletions, we found that compliance with the daily report protocol was adequate, with a 72.9% response rate. Inspection of all daily measures indicated that they were uniformly positively skewed in nature, and they were thus log-transformed before analysis.

Results

Analysis Strategy

The current dataset exhibits a nested structure, in which multiple daily reports are nested within each individual participant. Although it is possible to aggregate across daily reports and conduct a standard OLS regression analysis, this analysis strategy has many statistical shortcomings. First, it does not take into account the reliability or amount of data that each participant provided (Nezlek, 2008). Moreover, such aggregation techniques can sometimes lead to misleading conclusions (Raudenbush & Bryk, 2002). To overcome these shortcomings, we analyzed the current dataset using multilevel random coefficient modeling (MRCM), an analysis also referred to as hierarchical linear modeling. This analysis takes into account the nested structure of the dataset and appropriately weighs each participant according to the reliability and amount of data they provided (Nezlek, 2001, 2008; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). Daily measures were modeled at Level 1, and implicit laboratory predictors were modeled at Level 2. Analyses were conducted using SAS Proc Mixed (see Singer, 1998, for an accessible introduction to this analytic tool). A summary of analyses testing the central hypotheses can be found in Table 1.

Preliminary Concerns

As a first step in our analyses, we sought to determine whether there were significant individual differences in each of the relevant daily measures (i.e., anger, aggression, blame, and perceived provocation). To do so, we first estimated the unconditional model (Nezlek, 2008; Raudenbush & Bryk, 2002). Each daily measure was entered as the outcome variable in a separate analysis, and error terms were estimated at both the within-subject and between-subjects level. This analysis is comparable to a traditional ANOVA, in that it seeks to determine whether there are significant variations in the dependent measure between the different "groups" (or in this case, participants; Raudenbush & Bryk, 2002). Across all measures, there was clear evidence of significant variance at the between-subjects level: anger: $\tau = .0027$, $Z = 4.35$, $p < .0001$; aggression: $\tau = .0065$, $Z = 4.60$, $p < .0001$; blame: $\tau = .0051$, $Z = 4.17$, $p < .0001$; perceived provocation: $\tau = .0078$, $Z = 4.68$, $p < .0001$.

Daily Anger Results

Our first substantive prediction was that both implicit hostile transferences and inferences would independently predict individual differences in daily anger, whereas nonhostile transferences and inferences were expected to exhibit no such relationships. To test this hypothesis, all four implicit cognitive measures were simultaneously entered as Level 2 predictors of participants' daily anger levels. Results clearly supported the hypotheses. Both hostile transferences, $\gamma = .01$, $p = .03$, standardized $r = .29$, and hostile inferences, $\gamma = .02$, $p = .01$, standardized $r = .35$, were positively related to daily anger levels.³ Neither nonhostile transferences nor nonhostile inferences exhibited any significant relationship with daily anger, $ps > .30$, indicating that the patterns obtained were indeed specific to hostile inferences and transferences. These predictors accounted for 22.4% of the between-

subjects variance in daily anger, and significant between-subjects variation in daily anger remained after accounting for such relationships, $\tau = .0021$, $Z = 4.05$, $p < .0001$.

Daily Aggression Results

Our second prediction was that hostile transferences and inferences would provide separate and unique contributions to the prediction of individual differences in daily aggressive behavior, while nonhostile transferences and inferences would exhibit no such relationship. To test this prediction, an analysis parallel to the above daily anger analysis was conducted. The results provided only partial support for hypotheses. Spontaneous hostile inferences were positively related to aggressive behavior, $\gamma = .03$, $p = .006$, standardized $r = .36$. However, spontaneous hostile transferences exhibited no significant relationship with daily aggression, $\gamma = .0004$, $p = .75$, standardized $r = .04$. The potential reasons for this dissociation are discussed in the General Discussion. Neither nonhostile transferences nor nonhostile inferences significantly predicted daily aggression, $ps > .84$. These predictors accounted for 10.5% of the between-subjects variance in daily aggression, and significant between-subjects variation remained after accounting for these predictors, $\tau = .0057$, $Z = 4.35$, $p < .0001$.

Daily Interpretation Results

A clear implication of the proposed model is that implicit hostile inferences should predict hostile interpretations reported in daily life, whereas implicit hostile transferences should be unrelated to such daily hostile interpretations. Regardless of how hostile interpretations were operationalized, this proved to be the case. Implicit hostile inferences were positively related to both daily blame, $\gamma = .03$, $t = 3.30$, $p = .001$, standardized $r = .31$, and perceived provocations, $\gamma = .04$, $p = .009$, standardized $r = .34$. However, implicit hostile transferences were unrelated to both measures; daily blame: $\gamma = .008$, $p = .45$, standardized $r = .11$; perceived provocations: $\gamma = .007$, $p = .58$, standardized $r = .08$. Neither nonhostile inferences nor nonhostile transferences demonstrated a significant relationship with daily hostile interpretations in either form, all $ps > .54$. These predictors accounted for 18.9% of the between-subjects variance in daily blame, and 9.7% of the between-subjects variance in perceived provocations. Significant between-subjects variation in both measures remained after accounting for the implicit laboratory predictors, blame: $\tau = .0041$, $Z = 4.17$, $p < .0001$, perceived provocation: $\tau = .0071$, $Z = 4.44$, $p < .0001$.

Mediational Results: Daily Anger

The proposed model suggests that daily hostile interpretations should mediate the relationship between implicit hostile inferences and daily anger; whereas the relationship between implicit hostile transferences and daily anger should be independent of hostile

³ In the current investigation, we used Hunter and Schmidt's (1990) formula for calculating the standardized effect size r : $r = t/(t^2 + n - 2)^{1/2}$. This formula has been used in several prior daily diary MRCM investigations to provide standardized effect size estimates (e.g., McCullough, Fincham, & Tsang, 2003).

Table 1
Summary of Mediation Analyses

Variable	Predictor (x), Potential mediator (m)			Sobel test
	x-m	m-y	x-y	
Outcome variable (y): Daily anger				
Hostile inferences				
Blame	.41**	.88***	.35*/.22	3.21**
Perceived provocation	.34**	.86***	.35*/.17	2.68**
Hostile transferences				
Blame	.11	.88***	.29*/.28*	0.75
Perceived provocation	.08	.86***	.29*/.28*	0.55
Outcome variable (y): Daily aggression				
Hostile inferences				
Blame	.41**	.89***	.36**/.28*	3.22**
Perceived provocation	.34**	.93***	.36**/.24 ⁺	2.72**
Hostile transferences				
Blame	.11	.89***	.04/.00	0.31
Perceived provocation	.08	.93***	.04/.00	0.27

Note. For the x-y column, zero-order relationships are presented to left of the slash and relationships controlling for the possible mediator are reported to the right of the slash. Sobel tests indicate Z values, whereas all other values represent standardized rs.

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

interpretations reported in daily life. Such a pattern would clearly support the position that hostile inferences represent an appraisal-like antecedent to anger elicitation, whereas hostile transferences represent a lower order, preappraisal antecedent to anger elicitation. Previous analyses were consistent with this proposal, in that implicit hostile inferences predicted both daily hostile interpretations and daily anger, whereas implicit hostile transferences predicted only daily anger.

To complete the final stage of this mediational analysis, we employed the analytic techniques originally developed for traditional OLS regression by Baron and Kenny (1986) and later adopted to multilevel random coefficient modeling by Krull and MacKinnon (1999, 2001). We once again estimated the relationship between the implicit laboratory measures and daily anger, this time controlling for daily hostile interpretations. To effectively serve as a covariate for the Level 2 predictor variables, daily hostile interpretation scores were centered around the sample's grand mean (Enders & Tofighi, 2007; Raudenbush & Bryk, 2002). Because the current investigation was not directly concerned with moderators of the within-subject interpretation-anger slope, this slope was fixed across all participants (Krull & MacKinnon, 1999). To provide converging support for predictions, this procedure was conducted separately with each measure of daily interpretations (i.e., blame and perceived provocations).

Both blame, $\gamma = .24$, $p < .0001$, standardized $r = .88$, and perceived provocations, $\gamma = .31$, $p < .0001$, standardized $r = .86$, proved to be strong predictors of daily anger. It was expected that after controlling for daily hostile interpretations, the relationship between implicit hostile inferences and daily anger would be significantly reduced. Regardless of how hostile interpretations were operationalized, this hypothesis was supported, controlling for blame: $\gamma = .01$, $p = .11$, standardized $r = .22$; controlling for perceived provocations: $\gamma = .009$, $p = .21$, standardized $r = .17$. Moreover, the Sobel (1986) test⁴ proved that the indirect effect of implicit hostile inferences through daily interpretations was highly

significant; blame: $Z = 3.21$, $p = .001$; perceived provocation: $Z = 2.68$, $p = .007$.

Beyond these inference-related findings, we expected that the predictive power of implicit hostile transferences would be relatively unaffected by the addition of daily hostile interpretations to the model. The results were consistent with this prediction. Hostile transferences continued to be a significant predictor of daily anger, controlling for blame: $\gamma = .01$, $p = .04$, standardized $r = .28$; controlling for perceived provocations: $\gamma = .01$, $t = 2.10$, $p = .04$, standardized $r = .28$. Moreover, Sobel tests yielded no evidence of an indirect effect of hostile transferences through daily hostile interpretations, all $ps > .40$. Thus, although the effects of implicit hostile inferences are mediated by hostile interpretations reported in daily life, the effects of hostile transferences proved to be quite independent of daily hostile interpretations.

Mediational Results: Daily Aggression

Implicit hostile inferences also predicted higher levels of daily aggression. Therefore, we sought to determine whether this link, too, could be understood in terms of tendencies to interpret daily events in more hostile terms. To test our hypothesis, we conducted mediational analyses parallel to those described for daily anger. Results supported expectations. Both blame, $\gamma = .34$, $p < .0001$, standardized $r = .89$, and perceived provocations, $\gamma = .58$, $p < .0001$, standardized $r = .93$, were positively related to daily

⁴ Although the use of the Sobel test has sometimes been criticized as inappropriate for MRCM mediational analyses involving random Level 1 slopes (e.g., Bauer, Preacher, & Gil, 2006), the current investigation had no a priori hypothesis concerning individual differences in the interpretation-anger slope, and thus this slope was fixed across all participants. Moreover, Krull and MacKinnon's (1999) simulation study indicates that within investigations involving a Level 2 sample size of ~ 50 , the Sobel test was a relatively unbiased estimate of the indirect or mediated effect.

aggression. After controlling for the influence of daily hostile interpretations, the predictive power of implicit hostile inferences was reduced, controlling for blame: $\gamma = .02, p = .03$, standardized $r = .28$; controlling for perceived provocations, $\gamma = .01, p = .08$, standardized $r = .24$. Moreover, the Sobel test indicated that regardless of how daily hostile interpretations were operationalized, the indirect effect of implicit hostile inferences through daily hostile interpretations was significant, blame: $Z = 3.21, p = .001$; perceived provocation: $Z = 2.72, p = .006$. Thus, there was evidence that implicit hostile inferences were at least partially exerting their influence on daily aggressive behavior by biasing situational interpretations in daily life.

General Discussion

Summary of Predictions and Results

There is a long history of debate regarding the antecedents of anger. Although appraisal and attribution theorists have emphasized hostile interpretations as the main determinant of anger (e.g., Lazarus, 1991; Weiner, 1986), CNA theorists have argued that hostile interpretations are not necessary for anger elicitation and that earlier associative processes may be sufficient (e.g., Berkowitz & Harmon-Jones, 2004a). Recently, there has been some acknowledgment on both sides of this theoretical divide that multiple processes may contribute to anger elicitation (e.g., Berkowitz & Harmon-Jones, 2004b; Smith & Kirby, 2004). The purpose of the current investigation was to empirically assess these proposals.

To cognitively model both hostile inferences and associative processes, we drew upon recent theoretical and methodological innovations in the person perception literature (Carlston & Skowronski, 2005; Todorov & Uleman, 2002). The literature has generally highlighted two processes involved in spontaneous trait attributions. The first process is purely associative and nonrational, as it involves attributing traits to communicators based on their descriptions of separate individuals' behavior. This process may capture the sorts of low-level processes favored by CNA theorists (Berkowitz, 1993). The second process is inference based and more rational, as it involves attributing traits to individuals based on their own behaviors. This process should capture the sorts of rule-based processes favored by appraisal and attribution theories (e.g., Crick & Dodge, 1994; Weiner, 1986).

The results provided evidence showing that both associative and spontaneous inferential processes contribute to anger elicitation. Implicit hostile inferences yielded findings consistent with classic appraisal and attribution theories of anger elicitation (Crick & Dodge, 1994; Weiner, 1986). Specifically, such tendencies predicted higher levels of anger and aggression in daily life, and these relationships were mediated by daily hostile interpretations. As low-level associative processes were systematically controlled for in these analyses, there can be little doubt that spontaneous hostile inferences render an individual more prone to anger and aggression outside the laboratory.

Support for the CNA perspective was also obtained. Individuals who displayed a nonrational tendency to exhibit spontaneous hostile transferences in the laboratory reported higher levels of anger in their daily lives. Moreover, relations of this type were independent of implicit hostile inferences assessed in the laboratory and hostile interpretations reported in daily life. Thus, these results

provide some of the most direct evidence to date that lower-order associative processes contribute to anger-elicitation and do so independently of higher-order hostile inferences. It is important to note, however, that hostile transferences did not predict aggression in daily life, a null result that will be discussed in greater detail below. Regardless, though, the current investigation provides clear support for recent moves toward an integrated model of anger elicitation, showing that both lower-order associative and higher-order inferential processes contribute to anger elicitation.

The Role of Associative Processes in Aggression

Berkowitz's (1990, 1993) CNA theory was designed not only to explain factors involved in the elicitation of anger, but it was also meant to specify the operations involved in triggering aggressive behavior. However, the current study found that hostile transferences predicted daily anger, but not daily aggression. There are a number of possible explanations for this dissociation. First, it is possible that participants high in hostile transferences were unwilling to report aggressing in the absence of provoking force, or they may be unaware of behaving in an aggressive manner.

Second, it is possible that hostile transferences do not provide sufficient information to elicit motivations for revenge. Past research has indicated that one needs to be aware of opportunities for revenge for approach-related revenge motivation to arise (Harmon-Jones, Lueck, Fearn, & Harmon-Jones, 2006; Harmon-Jones, Sigelman, Bohlig, & Harmon-Jones, 2003). Because hostile transferences do not provide information that a hostile trait belongs to a specific person (Carlston & Skowronski, 2005), they may fail to provide information about who revenge should be directed against. Finally, it is possible that individuals high in hostile transferences do become motivated by revenge when angry, but that they routinely inhibit such urges.⁵ Indeed, this is quite plausible, given that such individuals have no rational justification for their anger. CNA theory has long held that conscious interpretations serve to regulate the inappropriate urges resulting from anger (Berkowitz, 1990, 1993). Future research should seek to determine which of these explanations is most plausible.

Broader Implications for Affective Primacy and Cognitive Primacy

One of the most prominent debates in the emotion literature has revolved around the issue of whether emotions are a postcognitive phenomenon. Lazarus's (1991) appraisal theory suggested that emotions are the product of cognitive appraisals and he frequently characterized these appraisals as conscious and deliberative (see Kappas, 2006). Zajonc (1980) vehemently objected to this position, arguing that preferences emerge quickly and unconsciously, and a heated debate ensued (Lazarus, 1984; Zajonc, 1984). Recently, this debate has been resurrected in the anger literature specifically, with Berkowitz and Harmon-Jones (2004a, b) defending the position of affective primacy and appraisal theorists defending the position of cognitive primacy (e.g., Roseman, 2004; Smith & Kirby, 2004).

We suggest that it is time to move beyond this age-old debate. The time has come for emotion researchers to focus on construct-

⁵ We thank an anonymous reviewer for offering this suggestion.

ing more detailed models that explicitly acknowledge the multiple operations involved in emotion-elicitation. Although the current investigation cannot resolve all points of disagreement between appraisal and CNA perspectives (e.g., the role of peripheral physiology in anger elicitation; see Berkowitz & Harmon-Jones, 2004a, b; Roseman, 2004; Smith & Kirby, 2004), we nonetheless believe the current investigation makes two important contributions. First, we have conceptualized and assessed interpretations as the product of a spontaneous and automatic cognitive process (Carlston & Skowronski, 2005; Todorov & Uleman, 2002). This is an important contribution because, whereas attribution and appraisal theories have suggested that interpretations often operate in an automatic manner (Arrington, 1960; Kappas, 2006; Smith & Kirby, 2001), appraisal researchers have mostly continued to rely on conscious self-reports (e.g., Lazarus, 1995; Schorr, 2001). In methodological terms, then, our findings represent an important advance.

Second, the current investigation explicitly acknowledges that both early associative and later inferential processes contribute to the elicitation of anger, and the results of an intensive and ecologically valid daily diary study supported this supposition. Moreover, this investigation introduced an important theoretical and methodological perspective regarding how inferential processes are related to earlier associative processes. It is specifically suggested that associative processes represent a precursor to later inferential processes (Carlston & Skowronski, 2005; Crawford et al., 2007). We believe that this framework provides an important tool for understanding the contribution of multiple cognitive processes to emotion-elicitation. It is our hope that future researchers will employ these and similar implicit measures to more directly probe automatic inferential and associative processes involved in emotion-elicitation.

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AQ1: Author: Please verify if this is meant to be Dill, Anderson, & Deuser (1997). If not, add it to the reference list. Thank you.

AQ2: Author: Please add Roseman (2004) to the reference list or remove it from the text.

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