

Stressing the person: Legal and everyday person attributions under stress



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ARTICLE INFO

Article history:

Received 2 March 2014

Accepted 26 July 2014

Available online 29 August 2014

Keywords:

Fundamental attribution error

Stress

Person attributions

Cortisol

Legal decisions

ABSTRACT

When determining the cause of a person's behavior, perceivers often overweigh dispositional explanations and underweigh situational explanations, an error known as the Fundamental Attribution Error (FAE). The FAE occurs in part because dispositional explanations are relatively automatic, whereas considering the situation requires additional cognitive effort. Stress is known to impair the prefrontal cortex and executive functions important for the attribution process. We investigated if stress increases dispositional attributions in common place and legal situations. Experiencing a physiological stressor increased participants' cortisol, dispositional attributions of common everyday behaviors, and negative evaluations. When determining whether a crime was due to the defendant's disposition or the mitigating situation, self-reported stress correlated with increased dispositional judgments of defendant's behavior. These findings indicate that stress may make people more likely to commit the FAE and less favorable in their evaluations of others both in daily life and when making socially consequential judicial decisions.

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1. Introduction

In our daily lives we often interact with others under stress: a physician makes life-saving decisions, a businesswoman negotiates under high-stakes, a student receives critical feedback on a presentation. Stress has a profound effect on our thoughts, emotions, and how we regulate these processes, resulting in changes in our performance and decisions (Porcelli & Delgado, 2009). Specifically, stress negatively impacts our ability to engage in tasks that require complex and flexible thinking (Arnsten, 2009). Most stress research has focused on how stress affects cognitive functioning (Lupien, Maheu, Tu, Fiocco, & Schramek, 2007) or influences learning and memory systems (Roosendaal, Hahn, Nathan, de Quervain, & McGaugh, 2004). Less research has focused on how stress influences our interactions with and judgments of others and no studies

to our knowledge have extended these findings to socially consequential real-world person judgments (c.f. Richeson & Shelton, 2003). In social situations it is important not only to characterize how stress affects the perceiver, but also how stress affects the perception of others and how this relationship may impact legal decisions where assessments of responsibility are critically important.

Successful social decisions often result from accurately representing the cause of someone else's behavior. Decades of attribution research suggest that seeking explanations for others' behavior helps perceivers make sense of the world around them (Jones & Davis, 1965; Kelley, 1967). Unfortunately, this is a process fraught with biases and errors. For instance, a stranger who bumps into others is likely to be thought of as rude, even though the stranger may have just had his eyes dilated by the ophthalmologist. Although we quickly infer that the stranger's rude personality accounts for the collision, it is entirely possible that the situation fully explains the behavior. In judicial judgments, situational factors can be used to mitigate charges or exonerate defendants and thus are profoundly important in decisions of guilt. The tendency to overvalue dispositional explanations (i.e., an individual's personality characteristics) and undervalue situational explanations (i.e., the context in which

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the behavior occurs) is known as the Fundamental Attribution Error (FAE; Gilbert & Malone, 1995; Jones & Harris, 1967; Miller, 1976; Ross, 1977; Snyder & Jones, 1974).

Individuals may not simultaneously weigh behavioral and situational information when decoding behavior (Gilbert & Malone, 1995). Instead, attributing a cause to someone's behavior is a process that is proposed to unfold over time (Gilbert, Pelham, & Krull, 1988). First, perceivers categorize a behavior ("Amy refused to shake Brenda's hand"). Next, they characterize the behavior in dispositional (i.e., personality trait) terms ("Amy is rude"). These two processes are relatively automatic. Finally, given sufficient time and motivation, the observer applies information about the prevailing situational constraints on the behavior ("Amy has a highly contagious illness"). The initial dispositional inference is adjusted by incorporating situational information, if warranted, through a controlled, effortful correctional step (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Jones, 1979; Quattrone, 1982). The FAE occurs, in part, because automatic (versus controlled) processing has the advantages in our busy lives of speed and efficiency.

Because correcting a judgment requires mental effort, this last correctional step is more likely to be incomplete when cognitive resources are drained or busy, such as when individuals are under time pressure or under cognitive load, resulting in dispositional attributions (Baumeister et al., 1998; Gilbert et al., 1988; Gilbert & Jones, 1986; Jones, 1979; Quattrone, 1982). Gilbert and colleagues found that when participants are distracted during attribution judgments, they make more dispositional attributions. The researchers concluded that when cognitive resources are consumed by another task, the correctional step of adjusting initial dispositional inferences with relevant situational information is impaired. This model is supported by a recent brain imaging study that found increased activity in dorsolateral prefrontal cortex (DLPFC) — a region linked with executive functions, including working memory, selective attention, and executive control (Banich et al., 2001; MacDonald, Cohen, Stenger, & Carter, 2000) — when individuals made situational attributions (Brosch, Schiller, Mojdehbakhsh, Uleman, & Phelps, 2013).

In Gilbert et al. (1988), participants had two tasks to perform simultaneously, thus fundamentally making the attributional task one of divided attention. Another way that executive functions can be altered is by physiological stress. Stress has broad long-term effects on cognitive processes that may be critical in the attribution process. Stress results in neurohormonal changes that impair PFC function and a range of executive functions (Arnsten, 2009). Specifically, stress has a detrimental effect on tasks that require complex and flexible thinking (Arnsten, 2009), selective attention (Mogg, Mathews, Bird, & Macgregor-Morris, 1990), and working memory (Qin, Hermans, van Marle, Luo, & Fernández, 2009; Roozendaal et al., 2004; Schoofs, Wolf, & Smeets, 2009). Acute stress results in hypothalamic-pituitary-adrenal (HPA) axis activation and triggers the rapid sympathetic nervous system release of catecholamines that facilitates responding to stressors (Goldstein, 2003). Following this rapid release of catecholamines is the release of glucocorticoids, such as cortisol, which peak 20–30 min after stress exposure (Sapolsky, Romero, & Munck, 2000) and can be measured as a proxy for stress. One advantage of stress as a manipulation of executive function is that its effects last beyond the stressor itself. This permits examining how stress affects attributions without adding distractions or changing the structure of the task.

In the first study, we explore the effects of physiological stress on attribution judgments. Given that stress impairs executive functions, stress may also increase an individual's reliance on automatic, heuristic processes (Hoffman & al'Absi, 2004; Kahneman & Frederick, 2002; Reyna, 2004). In the second study, we extend our investigation into real-world, socially consequential person attributions where participants make attributions about legal

scenarios. In both studies, we hypothesized that participants under stress would be less able to recruit the cognitive resources necessary to correct their initial dispositional inferences, resulting in fewer situational attributions both in everyday scenarios and in legal decisions.

2. Study 1

In the context of study 1, we define stress as a disruption of homeostasis that results in subsequent activation of the hypothalamic-pituitary-adrenal (HPA) axis, widely considered the hallmark of a stress response (see De Kloet, 2004). Although an array of laboratory manipulations may result in cognitive interference, distraction, or negative affect, we specifically employed an acute stress manipulation that reliably elicits HPA-axis activation as assessed with increased cortisol, enabling us to measure a neuroendocrine assay of stress reactivity through saliva. By objectively assessing a stress response that disrupts homeostatic balance enough to provoke HPA activity, we can directly show that we successfully induced physiological stress in our participants. Importantly, our acute stress manipulation yields a neurohormonal stress response that persists after the stressor is over, allowing us to assess the impact of physiological stress on attribution judgments in the absence of distraction from the stress manipulation.

3. Methods

3.1. Participants

Analyses included 56 participants (38 females, 18–29 years of age; $M = 21.232$, $SD = 2.979$; White = 28, Black = 4, Asian = 12; Latino/Hispanic = 8, Middle Eastern = 4; see Supplementary materials for exclusion criteria). Participants were recruited at NYU via flyers. All gave informed consent and were paid \$15.00 for participation.

3.2. Cold-pressor task

The acute stress manipulation was a cold-pressor task (CPT), in which participants submerge their arm in ice-cold water for 3 min. This manipulation is commonly used to elicit the mild to moderate acute stress responses typical of everyday life (Schoofs et al., 2009). Before beginning with the attribution task, participants were randomly assigned to either submerge their arm to the elbow in ice-cold water (stress condition; 0–4 °C) or lukewarm water (control condition; 30–36 °C).¹

3.2.1. Neuroendocrine measurement

We assessed cortisol concentration in the saliva, as a measure of stress-induced glucocorticoid response, to confirm that our physiological stress manipulation was successful: at baseline, 5 min after the CPT, and 30 min after the CPT. Given that cortisol levels peak approximately 20–30 min post stressor, we predicted that participants in the stress condition would have significantly higher cortisol levels than those in the control condition at 30 min post-manipulation. All saliva samples were stored immediately after collection in a freezer and preserved at –20 °C. Samples were brought up to room temperature and centrifuged at approximately 3000 rpm for 15 min before being assayed by Salimetrics Testing Services (State College, PA).

¹ Self-reported stress was not collected in study 1. However, previous work finds that the cold-pressor increases self-reported stress (Otto, Raio, Chiang, Phelps, & Daw, 2013; Raio et al., 2013).

3.3. Attribution task

3.3.1. Stimuli

We adopted a task designed to produce roughly equivalent percentages of situational and dispositional attributions (see Brosch et al., 2013 for piloting procedures).² The stimuli consisted of 32 scenarios describing both behavioral information (e.g., “Tom left the restaurant in a hurry without tipping the waitress”) and situational information (e.g., “Tom’s baby was screaming”) in sequentially presented sentences. Half of the scenarios described a positive behavior and half described a negative behavior. Half of the targets were female and half were male. All faces displayed a neutral expression and targets were all White. The behavioral sentence and situational sentence were presented one at a time in counterbalanced order across conditions.

3.3.2. Attribution task procedures

Participants saw a sentence (either behavioral or situational) and a face for 6 s. After a 2 s fixation interstimulus interval (ISI), participants saw a second sentence (either behavioral or situational, depending on the first sentence) and the same face for 6 s. Following another 2 s fixation ISI, participants had 10 s to rate the degree to which the behavior was caused by situational or dispositional factors (1 = situational factors to 8 = dispositional factors). After another 2 s fixation ISI, the second rating slide asking the participant to rate how much they liked the person (1 = not at all to 8 = very much) was presented with the target face for 10 s. If the participant pressed a number before 10 s had passed during either rating period, a “Thank You” slide appeared for the remainder of the timeframe. If the participant failed to make a rating before the 10 s, the next fixation appeared on the screen, followed by an intertrial fixation interval of 2 s. The experiment consisted of 32 trials, each with a unique target and scenario, and lasted 38 s.

3.4. Procedures

To control for diurnal variations in cortisol, data were collected between 12 PM and 5 PM. Participants were told that they would provide saliva samples throughout the experiment, and for this reason drank 7 oz of water while filling out questionnaires. Then participants were familiarized with the attribution task. After 10 min, participants placed a sterile swab under their tongue for 1.5 min to obtain the baseline saliva sample. Participants were informed that they had been randomly assigned to either the cold- or warm-water condition and were asked to submerge their arm in the water for 3 min. Cold-water participants were told the water was between 0 and 4 °C but that there were no risks associated with completing the task. After 5 min, the experimenter obtained another saliva sample. If participants were unable to keep their arms in the water, the experiment was terminated and additional data were not collected. Immediately following the second saliva sample, approximately 7 min after the CPT or control manipulation, participants completed the attribution task that took approximately 25 min. Another saliva sample was collected at the end of the session, approximately 30 min after the CPT (see Supplementary materials).

4. Results and discussion

We conducted two separate analyses, of attribution and evaluation ratings, using 2 (target gender: male, female) × 2 (valence:

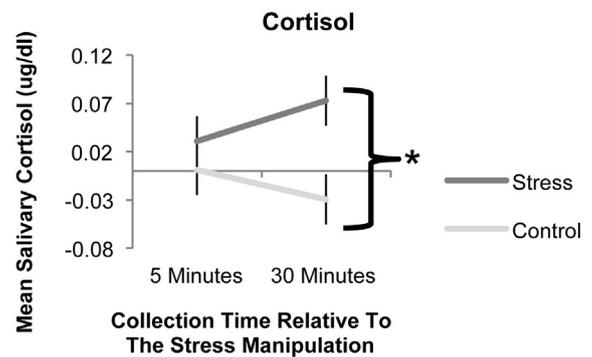


Fig. 1. Baseline corrected mean salivary cortisol values 5 and 30 min after the cold-pressor manipulation in both the stress group and the control group in study 1. Thirty min post stressor, participants in the stress group had more cortisol relative to their pre-stress baseline than those in the control group. Error bars represent ± 1 standard error. * $p < .05$, $n = 56$.

positive, negative) × 2 (order of information: situation first, situation second) × 2 (stress group: stress, control) repeated measure ANOVAs, with gender, valence, and order as within-subject factors and stress group as a between subjects factor. Our hypotheses were focused on stress group differences. For a discussion of within-subject effects, see the Supplementary materials.

4.1. Cortisol

There were no group differences in baseline cortisol ($F(1,54) = .15$, $p = .70$, $\eta_p^2 = .003$). However, there was considerable variability across individuals; therefore, tests of cortisol at times 2 and 3 were baseline corrected. Consistent with our prediction, there was a stress group × time interaction ($F(1,54) = 3.99$, $p = .05$, $\eta_p^2 = .07$; Fig. 1). At time 2, 5 min post-cold-pressor, there was slightly higher cortisol in the stress group ($M = .03 \mu\text{g/dl}$) than in the control group ($M = .001 \mu\text{g/dl}$, $F(1,54) = 2.66$, $p = .11$, $\eta_p^2 = .05$). At 30 min post-cold-pressor, these differences fully emerged. Cortisol was significantly higher in the stress group ($M = .07 \mu\text{g/dl}$) than the control group ($M = -.03 \mu\text{g/dl}$, $F(1,54) = 6.16$, $p = .02$, $\eta_p^2 = .10$), with the control group’s cortisol slightly, but not significantly, below baseline.

4.2. Attributions

As hypothesized, mean dispositional attributions of stressed participants were significantly higher than control participants, $F(1,54) = 4.27$, $p = .04$, $\eta_p^2 = .07$ (Fig. 2). This implies that exposing

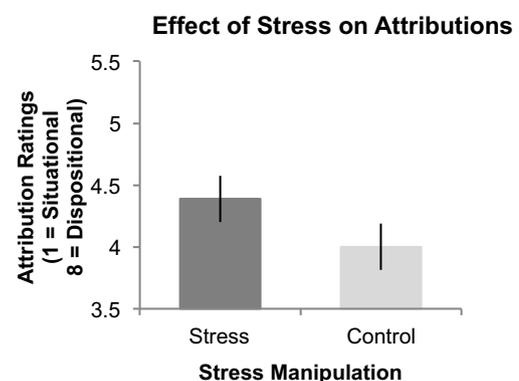


Fig. 2. Mean attribution ratings across information order, valence of the target, and gender of the target as a function of the stress manipulation in study 1. Mean attribution ratings in the stress condition were significantly higher than those in the control condition. Error bars represent ± 1 standard error. * $p < .05$, $n = 56$.

² Brosch et al., 2013 found increases in DLPFC during situational attributions when employing these exact same stimuli.

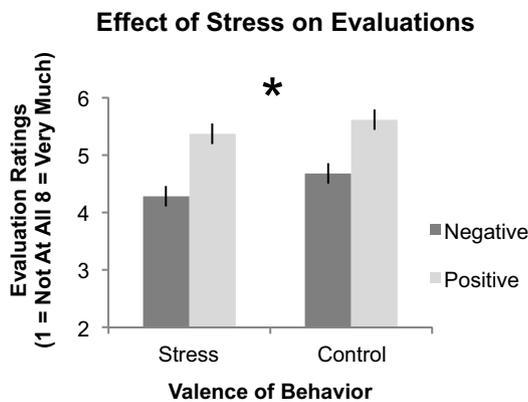


Fig. 3. Mean evaluation ratings across information order and gender of the target as a function of the stress manipulation in study 1. Mean evaluation ratings in the stress condition were significantly lower than those in the control for both positive and negative behaviors. Error bars represent ± 1 standard error. $*p < .05$, $n = 56$.

people to mild or moderate stress impairs their ability to complete the full attribution process, specifically the last step of incorporating situational information.

4.3. Evaluations

Mean evaluations of stressed participants were significantly more negative than those of the control participants ($F(1,54) = 4.97$, $p = .03$, $\eta_p^2 = .08$; Fig. 3). This occurred equally for both positive and negative behaviors (valence \times stress group interaction: $F(1,54) = .32$, $p = .57$, $\eta_p^2 = .01$).

5. Study 2

In study 1 we found evidence that physiological stress increases dispositional attributions and negative evaluations of attributions typical in daily life. In study 2 we extended these findings to explore how current perceived psychological stress affects legal attributions, a socially consequential real-world decision. Person attributions ascribe responsibility to behavior. Judgments of responsibility are critically important in the domain of legal decision-making and, given how common stress is in daily life, it is important to understand the role of stress in judicial decisions. The legal system ascribes blame and apportions punishment based on criminal action. Judgments of guilt are often inferred from the defendant's intentions and perceived characteristics of the accused (Shaver, 1985). Failure to focus on mitigating or exonerating factors can result in a greater likelihood of a guilty verdict than would otherwise occur. Similar to person attributions in daily life, attributions about the cause of a defendant's behavior are typically dispositional where jurors, lawyers, and judges assume that the defendant's action was primarily the result of his or her character and not merely the by-product of the defendant's circumstances (e.g. Kassin & Sukel, 1997). This tendency for dispositional assessments of criminal behavior may be compounded by the fact that legal officials are under great stress with mounting caseloads and the defendant's fate resting in the balance (e.g. Eells & Showalter, 1994; Lynch, 1993; Miller & Bornstein, 2004). Given that stress increases the FAE, life stresses of jurors, judges, lawyers, and officers may also increase dispositional judgments of criminal behavior.

Many people initially assume that criminal defendants are guilty (e.g. Kassin, 2005). Yet there are numerous mitigating situational factors in criminal cases, and these factors can greatly influence decisions of guilt. However, even when such situational factors are emphasized, judicial officials and jurors still have a difficult time taking them into account (e.g. Carroll, 1978; Feidman & Rosen,

1978; Fontaine & Emily, 1978; Kaplan & Miller, 1978; Riedel, 1975; Weiner, 1995). For example, when jurors are made explicitly aware that a confession was coerced, or that eyewitness identification occurred under very suboptimal conditions, they still find the defendant guilty (Glaser, Calhoun, Bradshaw, Bates, & Socherman, 2001; see also Kassin & Sukel, 1997; Stewart, 2005; Woolfolk, Doris, & Darley, 2006). In addition to the tendency to attribute defendant's behavior to internal stable characteristics, individuals are also motivated to believe in a just-world where "bad things happen to bad people" and "people get what they deserve and deserve what they get" (Lerner, Goldberg, & Tetlock, 1998; Lerner, 1980; Lerner & Miller, 1978; Lerner & Simmons, 1966; Lerner, 1965; Maes, 1998; Rubin & Peplau, 1973). All these factors contribute to dispositional attributions for defendants' behaviors at the expense of situational attributions. The purpose of study 2 was to explore how stress relates to attributions of criminal behavior. It was predicted that, as in study 1, increased stress should correspond with increased dispositional attributions of criminal behavior. Moreover, we extended our investigation to self-reported psychological stress, a free measure that is accessible to scholars from variety of disciplines.

6. Methods

We recruited 204 United States participants (85 females, 19 to 71 years of age; $M = 37.21$, $SD = 12.84$; White = 171, Black = 9, Asian = 6; Latino/Hispanic = 8, Middle Eastern = 2, Native American = 3, Biracial/Multiracial = 5) from the online labor market Amazon Mechanical Turk (AMT; Buhrmester, Kwang, & Gosling, 2011; Horton, Rand, & Zeckhauser, 2011; Mason & Suri, 2012; Paolacci, Chandler, & Ipeirotis, 2010).³ AMT allows researchers to contract participants to perform tasks in exchange for small payments. Our subjects were paid \$0.50. AMT provides a more representative sample of United States participants that more accurately approximate jury demographics (Buhrmester et al., 2011). For more information on AMT and our sample, see the Supplemental materials.

6.1. Procedures

After consenting, participants read that they would make judgments about legal scenarios. They were familiarized with the rating scales for each question and were told that there were no right or wrong answers. The AMT participants rated 30 vignettes, presented in a random order, depicting a range of criminal acts. The vignettes included those used in previous research on attributions and crime (Hawkins, 1981) and some created for the purpose of this study (see Appendix 1 in the Supplementary materials). The vignettes were selected to elicit a range of attribution ratings (i.e. some rated as dispositional, some rated as situational, and some producing no consensus; see Supplementary materials). Examples included, "A 13-year-old boy in the slums of Chicago robs an 87-year-old man of \$2.27" and "A woman stabs another woman to death after an argument". For each vignette, participants rated the cause of the behavior on an 8-point scale (1 = situational factors to 8 = dispositional factors). Participants were instructed that situational factors could be something about the person's environment, their upbringing, or their circumstances, and that dispositional factors could be something about the person's character or who they are as a person.

After participants made an attribution judgment for each scenario, they rated whether they felt the behavior was

³ Age of the participant did not moderate any of the reported effects.

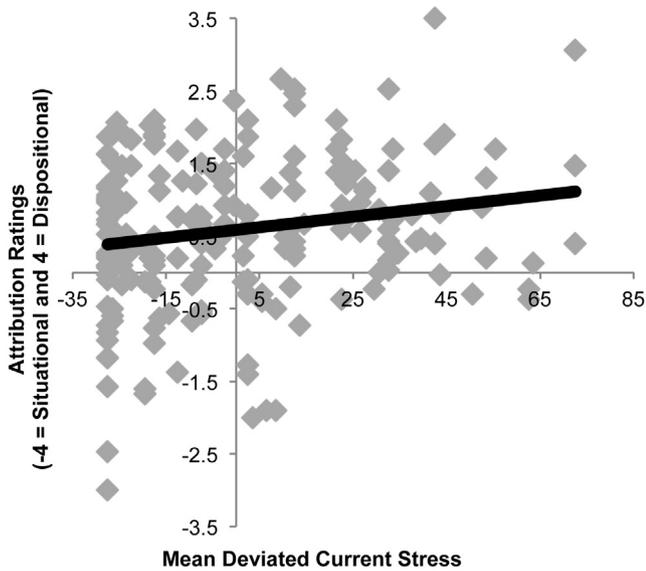


Fig. 4. The relationship between current stress and legal attributions in study 2. As current stress increases, dispositional judgments of an offender's behavior increase.

criminal (1 = *strongly disagree* to 5 = *strongly agree*), whether they would describe the behavior as negative (1 = *strongly disagree* to 5 = *strongly agree*), how much they liked the offender in each scenario (1 = *dislike extremely* to 9 = *like extremely*), and finally they made a recommendation about punishment (1 = *least severe punishment* to 100 = *most severe punishment*). These measures were not the focus of this study, but we include the correlations in the Supplementary materials.

After completing the scenario ratings, participants rated their current level of stress (0 = *not stressed at all* to 100 = *extremely stressed*) and then, as a measure of longer-term stress, rated how stressed they felt in the last month (0 = *not stressed at all* to 100 = *extremely stressed*). Following the two main stress measures (current and chronic stress), participants completed two other commonly assessed longer-term stress measures, the Chronic Stress Scale (Turner, Wheaton, & Lloyd, 1995) and the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). Then participants completed the Positive and Negative Affective Schedule as a measure of positive and negative current emotion (Watson, Clark, & Tellegen, 1988). For this scale participants indicated to what degree they felt each emotion right now (1 = *very slightly or not at all* to 5 = *extremely*).

7. Results and discussion

7.1. Stress and legal attributions

As predicted, current stress correlated with legal attributions, such that as current stress increased, dispositional assessments of criminal behavior increased ($\beta = .19$, $t(202) = 2.70$, $p = .008$, $R_p^2 = .04$; Fig. 4).⁴ The relationship between current stress and attributions remained significant when controlling for chronic stress ($\beta = .18$, $t(201) = 2.41$, $p = .02$, $R_p^2 = .03$) and there was no relationship between chronic stress and attributions ($\beta = .01$, $t(201) = .12$, $p = .91$, $R_p^2 < .001$). This is important in reducing the likelihood that

⁴ Participants were allowed to respond 0 on the current and chronic stress continuous scales. Some participants selected 0 on these scales resulting in positively skewed distributions. Therefore, we log-transformed current and chronic stress. All analyses are run on log-transformed predictors but graphs display raw stress ratings.

chronic stress accounts for the relationship between current stress and attributions.

In order to further explore the interactive relationship between self-reported current stress and attributions, we divided our scenarios into those that yielded an average attribution rating as situational (mean attribution rating below 3.5, $n_{scenarios} = 5$; $M = 2.98$), ambiguous (mean attribution rating centered on 4.5 midpoint, between 3.5 and 5.5, $SD > 2$, $n_{scenario} = 11$, $M = 4.55$), or dispositional (mean attribution rating above 5.5, $n_{scenario} = 14$, $M = 6.27$).⁵ For criminal scenarios rated as caused by the situation by most participants, as current stress increased so too did dispositional attribution ratings ($\beta = .19$, $t(202) = 2.80$, $p = .006$, $R_p^2 = .04$). For criminal scenarios rated as ambiguous, with no consensus as to the cause of the behavior, as current stress increased so too did dispositional attribution ratings ($\beta = .18$, $t(202) = 2.60$, $p = .01$, $R_p^2 = .03$). However, for criminal scenarios that were rated as caused by the individual's disposition by most participants, the relationship was weaker ($\beta = .11$, $t(202) = 1.56$, $p = .12$, $R_p^2 = .01$). Chronic self-reported stress never emerged as a predictor of attribution ratings when scenarios were classified into the three attribution categories ($ts(201) < 1.00$, $ps > .34$, $R_p^2s < .004$).

Previous research finds that individuals in a negative mood are more critical of negative behavior (Forgas & Locke, 2005). In study 2, we measured self-reported current negative affect to investigate the relationship between stress, negative affect, and legal attributions. To explore whether stress increased negative moods and whether this increased negative mood resulted in increases in dispositional criminal attributions, we tested a mediation model (Baron & Kenny, 1985). There was a direct relationship between stress and negative affect as reported in the PANAS (path a, $\beta = .47$, $t(183) = 7.22$, $p < .001$, $R_p^2 = .22$). As current stress increased negative affect increased.⁶ Negative affect also predicted attributions (bivariate correlation between negative affect and stress, $\beta = .15$, $t(183) = 2.01$, $p = .046$, $R_p^2 = .02$). As negative affect increased dispositional attributions increased. However, current negative affect did not mediate the relationship between stress and attributions (path b, $\beta = .09$, $t(182) = 1.06$, $p = .29$, $R_p^2 = .006$) and including negative affect did not significantly improve the original model of current stress predicting attribution ratings ($F_{change}(182) = 1.12$, $p = .29$, $R_p^2 = .03$).⁷

These results both confirm and extend study 1. Importantly, when mitigating factors exist in criminal scenarios, individuals might be less likely to attribute the crime to those situational factors when they are under stress.

8. General discussion

Using both experimental and correlational methods, the current study highlights how everyday stress relates to our attributions and evaluations of others. We found that physiological stress increased dispositional attributions in daily life situations and that self-reported stress was correlated with increased dispositional attributions for legal scenarios. These results support a three-step model of person attributions that ends with controlled correction for situational information (Gilbert et al., 1988), and underscore

⁵ Fewer legal scenarios were rated as situational. In addition, there was less consensus when legal scenarios were rated as situational compared with dispositional (see Supplementary materials).

⁶ Participants were not required to respond to every question in the survey. Therefore, only 184 of the 204 participants completed the PANAS. Those are the individuals included in the mediation analyses.

⁷ Although negative affect did not mediate the relationship between current stress and attribution ratings, when negative affect was included in the model the effect of stress on attribution ratings became non-significant (path c, $\beta = .13$, $t(182) = 1.54$, $p = .13$, $R_p^2 = .013$).

the importance of stress in person perception. Given the frequency of daily stress, researchers may have underestimated how much individuals attribute behavior, both positive and negative, to dispositions rather than situations. Stressed individuals are more likely to make dispositional (rather than situational) attributions, and to negatively evaluate the behaviors of others. Our findings are consistent with the suggestion that the FAE results in part from impairments in executive functions, and increased habitual behavior that occurs with stress (Schwabe & Wolf, 2009, 2010). Importantly, stress was also related to increased dispositional attributions for potentially consequential legal judgments (Lassiter & Irvine, 1986; Lassiter, Slaw, Briggs, & Scanlan, 1992; Woolfolk et al., 2006).

Brosch et al. (2013) recently found increased DLPFC activity when individuals made situational as opposed to dispositional attributions, providing evidence that avoiding the FAE recruits a brain region critical for cognitive control and other executive functions. Acute stress functionally impairs the PFC, specifically producing significant metabolic reduction in the DLPFC (Qin et al., 2009). The results of our correlational study suggest a tentative conclusion that the relationship between stress and attributions is the result of current stress, and not necessarily the result of chronic stress. The findings from study 2 are consistent with those of study 1 where acute stress was manipulated. These findings fit with current biological models of stress whereby acute stress, as opposed to chronic stress, rapidly impairs DLPFC function as a result of catecholamine release, dampening connectivity between the amygdala and PFC (Arnsten, 2009; Lovallo, 1975). Together these findings suggest that the DLPFC is involved in correcting automatic dispositional inferences by incorporating situational information into person judgments (MacDonald et al., 2000).

The DLPFC, which is especially impaired by stress, helps to maintain and manipulate information used to alter an initial emotional response or social impression and is critical for working memory (Arnsten, 2009; Qin et al., 2009). Working memory is important in the FAE task because individuals must hold all of the information about the behavior and the situation in mind when rating the cause of the behavior. There are multiple components of executive function – attention, mental flexibility, and inhibition – that may be impaired by stress. Although it remains unclear which specific component of executive function facilitates correction of the FAE, it is likely supported by several interacting components, all of which rely on the DLPFC (Brosch et al., 2013). Although, we did not directly measure executive function in either study 1 or study 2 or directly measure HPA activity in study 2, the results of the two studies are consistent. Moreover, the results of study 1 and study 2 are consistent with existing models of the FAE that posit a role for executive function in person attributions (e.g. Baumeister et al., 1998). Future research should directly measure executive function and consider whether physiological stress increases criminality attributions. Additionally, it is important to note that the effect of self-reported stress on legal attributions was relatively small. This indicates that although we were able to explain a portion of the variance in legal attributions, there was still a large degree of unexplained variability. Although the findings represent an important contribution to our understanding of how life factors influence legal decision-making, there was still a significant amount of the variability in legal attributions that was not explained, and scholars should use caution when considering practical applications of this research.

In our study, we believe the effects observed are due to the impact of acute stress on HPA axis activation and are not simply the result of increased general arousal. Although emotional arousal and stress may exist on a continuum that varies on a number of constructs, stress can also be distinguished from general emotional arousal in a number of ways. First, while emotional arousal

can be triggered both by positive or negative cues or experiences, stress primarily occurs after exposure to aversive psychological (i.e., negative evaluation, social rejection) or physiological events (i.e., hunger, lack of sleep, pain). Second, consistent with the notion that these constructs exist on a continuum, emotional arousal has been widely shown to promote adaptive behavior by signaling that something is salient or relevant, and often facilitates performance and behavior. Arousal responses can be transient to discrete events, such as conditioned or unconditioned aversive responses that do not result in the measurable neurohormonal changes consistent with stress (Raio, Orederu, Palazzolo, Shurick, & Phelps, 2013). However, we define stress as occurring when the intensity of arousal is high enough that HPA activity is engaged to enable an individual to cope with an experience, indicating that an individual has undergone a robust disruption in homeostasis that exceeds that of simple arousal and persists longer (for additional discussion see Supplementary materials).

Stress could have an even more deleterious influence on the attribution process during intergroup interactions, exacerbating these biases for certain social groups. Dispositional attributions can lead to racial profiling when an investigator or jury first encounters a witness or defendant (Shaver, 1970, 1985; Sommers & Ellsworth, 2000). Dual-process models of stereotyping and prejudice (e.g. Macrae, Bodenhausen, & Milne, 1998; Payne, 2005) propose that stereotypes and prejudices are automatically activated and that cognitive control inhibits expression of race bias. Under stress, individuals may be less able to inhibit implicit race bias. Intergroup contact induces anxiety and produces physiological threat responses (Blascovich, Mendes, Tomaka, Salomon, & Seery, 2003; Mendes, Blascovich, Lickel, & Hunter, 2002). Research by Richeson and Shelton (2003) found that interaction with an outgroup partner impairs subsequent performance on an executive control task. Moreover, intergroup interactions increase cortisol and reduce controlled processing of implicit stereotypes (Amodio, 2009). Thus, intergroup interactions induce a stress response that affects stereotyping. General stress in daily life may similarly increase racial bias.

Because we are almost always short of time, under stress, and bombarded with tasks and distractions, our findings shed light on how our environment impacts our judgments of those around us. In circumstances where social interaction and making correct attributions is vital, such as in patient diagnoses or criminal law, understanding the attribution process and factors that can impair it are essential to a successful and just outcome. Such errors may be especially likely in emergency or courtroom settings where stress runs high (Kowalski-Trakofler, Vaught, & Scharf, 2003). When a judicial official attributes an offender's behavior to their circumstances, they are more likely to advocate rehabilitation than punitive judgments (Cullen, Clark, Cullen, & Mathers, 1985; Grasmick & McGill, 1994), whereas criminals whose behavior is thought to be the result of internal factors are considered treatment resistant and dangerous (Hanson & Slater, 1988; Kelly, 2000). Our findings suggest that, given how common cognitively challenging tasks and stressors are in daily life, researchers may underestimate how much individuals negatively evaluate others and rely on dispositional attributions for their behavior.

Acknowledgements

This research was conducted in part thanks to the NYU Dean's Undergraduate Research Fund and the National Institute of Mental Health (RO1MH08075605 and RO1AG03928305). Thank you to Gregory D. Webster for comments and suggestions on analyses and Jerry Kang for comments on stress in legal contexts.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.biopsycho.2014.07.020>.

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