“Your taste in fashion is bad”: The role of state of anger in aggressive behavior using the hot sauce paradigm

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“Your taste in fashion is bad”: The role of state of anger in aggressive behavior using the hot sauce paradigm

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Abstract: This study investigates a mediator of the link between anger induction and subsequent aggressive behavior: the state of anger. One hundred three female participants were randomly assigned to three groups and were given negative feedback, positive feedback or no feedback (control group) on their fashion tastes. Then, the participants completed the State-Anger Expression Inventory (STAXI; Spielberger, 1999) to assess their state of anger. Afterward, participants completed the hot sauce paradigm to measure aggressive behavior. As hypothesized, those who received negative feedback exhibited higher states of anger levels and higher aggression levels than did participants who received positive feedback or those in the control group. The state of anger mediated the link between anger induction and aggressive behavior. Anger induction increased the state of anger. This state of anger, in turn, was positively related to aggressive behavior.

Subjects: Social Psychology; Applied Social Psychology; Personality

Keywords: anger induction; state of anger; aggressive behavior; hot sauce paradigm

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PUBLIC INTEREST STATEMENT
Anger is one of the most difficult emotions to handle. Despite anger can be a good thing, because it gives a way to express negative feelings. However, it causes some problems, such as, increasing blood pressure and antisocial behaviors. Psychologists are interested in the relation between anger and aggression. We try in the present study to understand why anger induction increases aggression. Participants were presented with 20 fashion pictures and asked to choose the top 10 pictures among them according to their own fashion perception. Afterwards, they were given insulting peer feedback, positive peer feedback, or no peer feedback on their fashion tastes. Results showed that those who received insulting feedback on their fashion tastes had higher state of anger levels than did participants who received non-insulting feedback or those who did not receive any feedback. State of anger, in turn, was positively related to aggression.
Our understanding of the relationship between anger and aggression is inadequate (Hortensius et al., 2012). Studies have not yet been established under which conditions of anger lead to aggression (Steffgen & Gollwitzer, 2007). Many types of aggressive behavior are not driven by anger (Martin, 2020), and anger does not always produce aggression (Vernon, 2012).

Researchers distinguish between anger and aggression (DeMarco, 2015). While anger is an internal emotional response to a real or imagined menace, aggression is an external action (Baumeister & Bushman, 2014). Aggression specialists have posed the traditional hypothesis that when someone is angry, (s)he becomes aggressive (Geddes & Stickney, 2011). According to the cognitive neoassociation model (Berkowitz, 1990), aversive events that lead to negative affect can lead to aggression. However, researchers have indicated that the link between anger and aggression is not very strong (Berkowitz, 1993).

As an emotion, laboratory researchers have attempted to use techniques that permit the induction of anger that is similar to what occurs outside of the laboratory. Social psychologists have used cover stories and deception (e.g., interpersonal insults) to evoke anger (Coan & Allen, 2007). A previous study demonstrated that participants who were emotionally induced to experience anger rated their emotional state as negative and disagreeable (Gross & Levenson, 1995). Studies have also shown that the induction of anger affects cardiac function (Herreroa et al., 2010), induces deception (Yip & Schweitzer, 2016), and alters driving performance and attentional processing (Techera et al., 2017).

Regarding its relationship with aggression, one study found that induced anger results in increased tendencies toward aggressive attitude as measured by the word fragment task (Nederlof et al., 2014). Previous research has shown that participants induced to feel anger by women exhibited more aggressive behavior and were more accepting of rape beliefs and violence toward women (Intons-Peterson et al., 1989). Additionally, relevant research has shown that anger induction is correlated with left prefrontal cortex activity, which is correlated with aggressive behavior (Harmon-Jones & Sigelman, 2001). In a recent study, Cabral and Almeida (2019) found that inducing anger in people causes increased dominance-seeking and aggressive behaviors. Sprague et al. (2011) observed that for participants with high executive function abilities, the experiences of anger and hostility mediated the relationship between perceived stress and aggressive behavior. In addition, a previous study revealed that brain activity mediates the relationship between anger induction and aggressive behavior (Harmon-Jones & Sigelman, 2001). In addition, anger plays a mediating role between internalizing symptoms and aggressive behavior (Gresham et al., 2016). Another study found that anger induced by critical feedback, a sharp blow to the participants’ self-image, mediated the link between the state of narcissism and aggression (Li et al., 2015).

However, some studies have shown that anger is only weakly associated with aggression in and out of the laboratory (Giumetti & Markey, 2007; Nesbit et al., 2007). This relation between anger and aggression is likely to be affected by certain variables that are not taken into account in experimental research. The present study bridges this gap in the literature by investigating an increased state of anger as one possible explanation of why anger induction increases aggression. We focus on state of anger because it reflects the person’s emotional experience in a given context, from slight irritation to extreme fury (Spielberger, 1999).

Researchers (e.g., Anderson & Bushman, 2002) have proposed several suggestions that may explain the relation between anger and aggression. One of these explanations is that occasionally there is interference between anger and cognitive processes, as well as those usually used in moral reasoning and judgment. Additionally, anger permits an individual to maintain aggressive intentions permanently (Anderson & Bushman, 2002). Anger concentrates attention on frustrating events, profoundly increasing their processing, which facilitates the recollection of those aggravating events. Therefore, anger permits people to reestablish the state that existed during the initial frustrating circumstances.
Moreover, as an emotion, anger is as an information signal (Sun, 2008). For example, anger helps other people understand the reasons behind the desire for revenge. In addition, anger may resolve any ambiguity in social situations through hostile interpretations.

Furthermore, anger may prime aggression-related knowledge structures, such as schemes, scripts, and associated expressive motor behaviors. These structures are used by people to interpret situations and result in aggressive behavior in these situations. Because of the relationships between anger and these knowledge structures, it has been demonstrated that individuals focus more on anger-related stimuli than on neutral stimuli (Anderson & Bushman, 2002; Cohen et al., 1998).

In addition, previous research has examined whether aspects of emotions are universal or culture specific (e.g., Matsumoto & Hwang, 2012). Although cultural variations in the expression of anger were observed in previous studies (e.g., Kirchner et al., 2018), anger is considered a universal emotion (e.g., Ekman & Friesen, 2003) since it is experienced similarly across cultures (Sell et al., 2017).

The recalibration theory of anger (Sell, 2011; Sell et al., 2009) defines anger as a form of evolutionary adaptation that functions as a bargaining social tool for better treatment (Sell et al., 2017, 2009). According to this theory, anger is caused by cues when a target accords little or no importance to the actor’s welfare. Anger and ensuing aggression represent a signal to the target, informing him/her to reconsider his/her belittling treatment of the angry individual. Sell et al. (2017) tested various predictions derived from the recalibration theory of anger on issues such as the role of intentionality and justification in anger. The contexts in which anger occurs have been suggested as follows: when an individual has suffered a large cost, the benefit the perpetrator gains from imposing the cost on the individual was small, and the perpetrator imposed the cost knowing that the angered individual was the person to be affected. In addition, when a victim realizes the offense, the perpetrator attempts to reduce the victim’s anger by asserting that the benefit he obtained was large, the cost he imposed on the victim was small, and that he did not know that the angered individual was the person to be harmed. Twenty-three experiments were conducted using participants from six different cultures, namely, the USA, India, Australia, Romania, Turkey, and the Ecuadorian Amazon. Anger was induced using anger-inducing scenarios. All predictions were supported across all six cultures. Anger is triggered when a target does not sufficiently value the angry individual’s welfare compared with his own (Sell et al., 2017). In the present study, we focused on the prediction that participants become much angrier when they know that they were intentionality targeted by negative peer feedback.

0.1. Present research
In the present study, college students were randomly assigned to one of three groups and were given insulting peer feedback (anger induction group, \(N = 38\)), positive peer feedback (non-anger induction group, \(N = 34\)) or no peer feedback (control group, \(N = 31\)) on their fashion taste. Next, they were asked to complete the state of anger scale from the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1999). Afterward, they completed the hot sauce paradigm to assess aggressive behavior. We predicted that participants who received negative feedback would have a higher state of anger than participants who received positive feedback or those in the control group and that this higher state of anger, in turn, would be associated with higher levels of aggressive behavior.

0.2. Methods
We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study (following the recommendations of Simmons et al., 2012).

0.3. Participants
The participants included 103 female college students from Qatar University (18–35 years old, \(M_{\text{age}} = 21.35, SD = 3.12\)). All participants were native Arabic speakers. The participants did not receive any course credits or payments for their participation.
0.4. Procedures and measures
The participants were tested individually. All administered questionnaires were translated into Arabic. The participants were told that the researchers were studying women's taste in fashion. Upon arrival, participants completed a consent form, at which point, they were randomly assigned to one of three groups: the insulting group (anger induction group), the positive group (non-anger induction group), or the control group. All groups were presented with 20 colored pictures of models wearing various styles of Western clothing and asked to choose the top 10 pictures. The insulting and positive groups were informed that their choices would be evaluated by a peer and vice versa. For the insulting and positive groups, the experimenter presented the pictures selected by the peer and asked the participants to write one paragraph on the quality of the taste of the peer. Then, the experimenter left the lab with the pictures selected by the participant to be evaluated by the peer. Five minutes later, the experimenter returned with the participant's selected pictures with the feedback made by the ostensible peer, along with the text written by the participant on the pictures selected by the peer. We used an interpersonal insult as a suitable technique to induce anger (e.g., Bremner et al., 2011; Harmon-Jones & Sigelman, 2001; Summerell et al., 2019). The anger induction group received a text containing negative peer feedback (e.g., “This is one of the worst fashion choices I have seen in my life.”, “What bad taste!”). The non-anger induction group received positive peer feedback (e.g., “This is one of the best fashion choices I have seen in my life.”).

For the control group, no feedback was given regarding peer evaluation. After choosing the top 10 pictures, they were asked to read a text about the genetic or environmental factors that influence IQ.

To measure anger levels in the three groups of participants during the experiment, we used the State of Anger Scale from the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1999) This is a 15-item scale that measures how intensely a person experiences anger during a specific situation (e.g., I feel like yelling at somebody; 1 = not at all to 5 = very much so; Cronbach’s a = .92). There is one study that validated an Arabic version of the scale but used only 10 items of the state of anger (Nakajima et al., 2016). Therefore, we opted to use the Arabic translated version of the full state of anger scale.

Afterward, the experimenter explained the hot sauce paradigm used to measure aggressive behavior (Lieberman et al., 1999) to the participants. The experimenter thanked the participants for taking the time to participate in the study and said that there was another experiment on food preference that would be conducted in the same laboratory and asked if they would participate in it as well. All participants agreed to participate in the additional study. Participants were told that they were randomly assigned to play the role of “food administrator” in the experiment. For the insulting and positive groups, participants were told that they will prepare a bowl of rice for the same peer in the other room, who will play the role of “food taster”. The participants in the control group were told that they will prepare a bowl of rice for another participant in the other room. Afterward, participants were provided with a plate of rice and four bottles of Nando's sauces (hot sauce brand) and told that they could put the sauce on the rice and could choose the intensity of hot sauce, ranging from 1 least hot to 4 extremely hot and that the food taster (e.g., the peer who criticized their choice of fashion pictures) did not like spicy food (Barlett et al., 2009). Participants were not allowed to blend sauces and were told that the food taster would have to eat whatever amount was on the plate. In addition, if they desired to know how hot the sauces were before choosing one, they were told that they could taste the sauces from testers containing small quantities of sauce that were placed in front to each bottle provided with a small spoon.

The experimenter left the room for 5 min and then returned to bring the plate to the food taster. We weighed the sauce bottles and the rice bowl before and after the participant’s preparation using a sensitive digital scale to measure differences among the chosen quantities of sauce. The time lapse between the experimental conditions and the hot sauce preparation was approximately 5 to 7 minutes.
The hot sauce paradigm is a well-validated measure of laboratory aggression (Adachi & Willoughby, 2011a). Aggressive behavior was calculated by multiplying the hotness of sauce selected by the weight in grams (Saleem et al., 2015). Finally, participants completed the suspiciousness questionnaire. They were asked whether they knew the true objective of the study, whether other colleagues had told them about the study, and whether they were aware of any deception. None of the participants expressed suspicion about the experiment.

1. Results

1.1. Aggressive behavior

A one-way ANOVA was conducted with the induction condition (anger induction group, non-anger induction group, and control group) as the independent variable and the aggressive behavior (hot sauce × weight) as the dependent variable. As expected, participants who had been criticized for their fashion choices exhibited higher hot sauce scores than participants who received positive feedback or participants in the control group ($M = 34.79$, $SD = 47.19$; $M = 15.62$, $SD = 23.62$; and $M = 9.58$, $SD = 24.53$, respectively), $F(2,100) = 5.15$, $p = .01$, $\eta^2 = .093$) (see Figure 1).

The Fisher least significant difference test was used for post hoc comparisons. The LSD test indicated significant differences between the anger induction group and both the non-anger induction ($p = .02$) and control groups ($p = .003$). No significant difference was found between the non-anger induction group and the control group ($p = .48$).
1.2. State of anger
A one-way ANOVA was conducted with the induction condition (anger induction group, non-anger induction group, and control group) as the independent variable and the state of anger as the dependent variable.

As predicted, participants who had been criticized for their fashion choices exhibited higher levels of anger than participants who received positive feedback or participants in the control group ($M = 23.11$, $SD = 9.62$; $M = 17.35$, $SD = 5.44$; and $M = 16.68$, $SD = 3.67$, respectively) ($F(2, 100) = 9.28$, $p = .0001$, $\eta^2 = .169$).

Fisher’s least significant difference (LSD) indicated significant differences between the anger induction group and both the non-anger induction group ($p = .001$) and the control group ($p = .0001$). No significant difference was found between the non-anger induction group and the control group ($p = .70$).

1.3. Mediation analysis
We examined whether the state of anger might serve as a potential mediator for the link between anger induction and aggressive behavior (see Figure 2). We further examined this meditational effect using a bootstrapping method that takes into account the potential for bias in small sample sizes (Preacher & Hayes, 2004). We used the SPSS macro PROCESS http://www.afhayes.com as suggested by Hayes (2018).

Since the independent variable was categorical with three levels, two dummy codes (k-1) were created, and the control condition was used as a reference group (Hayes & Preacher, 2014). $X_1$ compared the non-anger induction group to the control group (non-anger induction group coded 0, control group coded 1), $X_2$ compared the anger induction group to the control group (non-anger induction group coded 0, anger induction group coded 1, control group coded 0).

The direct, indirect and total effects of induction condition on aggressive behavior were parameterized with three equations, one for $M$ and two for $Y$:

\[
M = \lambda_1 + \alpha_1 X_1 + \alpha_2 X_2 + e_M \tag{1}
\]

\[
Y = \lambda_2 + c' X_1 + c' X_2 + b M + e_Y \tag{2}
\]

\[
Y = \lambda_3 + c_1 X_1 + c_2 X_2 + e_Y \tag{3}
\]

The direct effect of induction condition on aggressive behavior was estimated from Equation (2). The indirect effect of induction condition on aggressive behavior through state of anger was estimated from Equations (1) and (2). The total effect of induction condition on aggressive behavior was estimated from Equation (3) (see Table 1).

The relative indirect effects of induction condition on aggressive behavior through state of anger were constructed by multiplying $\alpha_1$ and $\alpha_2 by b$.

\[
\alpha_1 b = 0.0904 \times 0.2610 = 0.0236
\]

\[
\alpha_2 b = 0.8598 \times 0.2610 = 0.2244
\]

As shown in Figure 2, the non-anger induction condition was not related to state of anger or to aggressive behavior. The indirect effect of non-anger induction on aggressive behavior through state of anger was nonsignificant (IE = 0.0236, 95% LLCI = -0.0600 to UPCI = 0.1234, which includes the value 0). In contrast, participants assigned to the anger induction condition exhibited higher states of anger (from the sign of $\alpha_2$, $\beta = .86$, $p = .0002$), which in turn increased aggressive behavior (from...
Figure 2. Multiple mediation model of the indirect effect of induction condition on aggressive behavior through state of anger with a multcategorical independent variable. $X_1$ codes the non-anger induction group, $X_2$ codes the anger induction group, and the control group functions as the reference group and receives a code of 0 on $X_1$ and $X_2$. The $\beta$s in parentheses were obtained from a model that included the multicategorical independent variable and the mediator as predictors of aggressive behavior. **$p < 0.01$, ***$p < 0.001$.

Table 1. Estimated coefficients for Equations (1), (2) and (3), extracted from PROCESS macro using dummy coding

| Outcome: | $M$ | $Y$ |
|----------|-----|-----|
|          | Coefficient | Coefficient | Coefficient |
| Constant | $i_1$ | 16.6774**** | $i_1$ | 9.5806 | $i_2$ | −11.2925 |
| $X_1$    | $a_1$ | 0.0904 | $c_1$ | 0.1684 | $c_1$ | 0.1448 |
| $X_2$    | $a_1$ | 0.8598*** | $c_2$ | 0.7031** | $c_2$ | 0.4787 |
| $M$      | $b$ | 0.2610** |       |       |       |       |

Note. The PROCESS macro generates the constant regression coefficients in unstandardized form. **$p < 0.01$, ***$p < 0.001$, ****$p < 0.0001$.

the sign of $b, \beta = .26, p = .01$). When both anger induction and state of anger were included in the model, the effect of anger induction was nonsignificant (from the sign of $(c'_2, \beta = 0.48, p = .051)$. A test for indirect effects revealed that anger induction increased participant aggressiveness through state of anger(95% LLCI = 0.0284 to ULCI = 0.4683, which excludes the value 0). In short, being insulted increased participants’ aggressive behavior through state of anger.

2. Conclusions

Consistent with previous studies (e.g., Novaco, 2011; Wilkowski & Robinson, 2010), participants who experienced anger were more engaged in aggressive behavior reflected by their allocating more hot sauce for their ostensible partner. As predicted, aggressive behavior was greater among those who were angered by the insulting feedback.

We used the hot sauce paradigm to measure both direct and unambiguous aggressive behavior (Lieberman et al., 1999). One of the major problems with other laboratory aggression measures is that the motivation that leads individuals to behave aggressively is ambiguous (Adachi & Willoughby, 2011b). Accordingly, because individual aggressive behavior is defined as behavior that is planned to harm another person, it was uncertain from prior studies whether individuals viewed their behavior as competitive rather than aggressive (Lieberman et al., 1999).

One principal goal of our research was to determine whether state of anger measured by the State Anger Expression Inventory (STAXI) mediated the link between experimentally induced anger by provocation and aggressive behavior. Regarding the mediation analyses, the results showed that
state of anger mediates the link between anger induction and aggressive behavior. This is in accordance with the literature on anger showing the mediating role of anger (e.g., Gresham et al., 2016). This result raises an interesting theoretical issue: intense emotional states measured during the experiment play an important role in determining aggressive behavior. The data from this study yielded several practical applications. First, therapists and councilors can benefit from more accurately measuring states of anger or attempts to identify certain emotions to adequately facilitate their therapeutic interventions. Indeed, our study shows that changes in the state of emotion greatly affect individuals' behavior. It is recommended that clients or patients be given take-home diaries in sessions where monitoring of the emotional state is important in the psychological assessment. Based on these diaries, therapists can measure the progress of client’s emotions when dealing with their behavioral issues. Furthermore, our study suggests that negative emotions can evoke aggressive behavior. Therefore, it is important for social psychologists to consider the state of negative emotions as they can affect behavioral responses during their experimental investigations.

The current study with Middle Eastern participants extends findings observed in non-Western samples (studies), as the studied effects testify unequivocally to the robustness of the universality of the emotions hypothesis as emotions were proven again to be insensitive to cultural modulation (Sell et al., 2017). The present research adds to the body of literature that adopts the universal perspective of anger (e.g., Sell, 2011). These results reinforce the expectation that there is low variance across cultures in the fundamental features of anger.

Furthermore, the present results support predictions derived from the recalibration theory of anger that the pressure of the weighting put on the participant is significantly heightened through the peer's insult. Indeed, the participant’s welfare was more likely to be influenced by the perceived intention of the peer to harm him/her through harsh critiques. Consequently, this was reflected in the decision made by the participant to exhibit aggression toward the peer. Hence, aggressive behavior represents in this context a bargaining tool to recalibrate participant welfare (Sell et al., 2017).

There are several limitations to this study that should be acknowledged. First, this study included only female participants due to the presence of the laboratory on the Qatar University female campus.

Second, the control group did not receive any feedback. This might affect the equivalence between groups. In addition to the negative and positive feedback, it might be better to create a neutral social feedback that could maintain similarity to the other groups.

In our study, we only tested the potential mediation effect of state of anger between anger induction and aggression. We used an insult as negative social feedback due to its proven efficacy by previous studies in inducing anger (e.g., Hortensius et al., 2012). Indeed, in the Harmon–Jones and Sigelman study (Harmon-Jones & Sigelman, 2001), insulted participants significantly differed from noninsulted participants in only anger emotion but not in fear or positive affect. Having said that, the lack of control for other possible emotions is a limitation to our study.

Furthermore, due to physiological changes during anger induction (Stemmler, 1992), it would be important to include physiological measures in future research, such as cardiac coherence (see Hasan et al., 2013), to investigate the possible mediation effects on the relationship between anger induction and aggressive behavior.

In summary, this study examined the state of anger as a mediator of the link between anger induction and aggressive behavior. As predicted, anger induction increased the state of anger. The state of anger was in turn associated with more aggression. This research offers another possible reason why anger induction can increase aggressive behavior: by producing an intense emotional state.
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