

Intergroup Threat and the Linguistic Intergroup Bias: A Stress Biomarker Study

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Sinthujaa Sampasivam¹ , Katherine Anne Collins²,
Catherine Bielajew¹, and Richard Clément¹

Abstract

This study investigates the physiological consequences of derogation. In the face of an ingroup threat, an opportunity to derogate the outgroup is associated with increases in salivary cortisol, a stress biomarker. These findings support the intergroup anxiety model, which suggests that following an anxiety-inducing threatening experience, outgroup evaluations can amplify emotional reactions and stress. In this study, we investigated whether threatened participants who derogated would show higher cortisol levels. Canadian undergraduates ($N = 169$) read either a threatening or favourable passage about Canadians. They then engaged in either a linguistic intergroup bias (LIB) or control task. Salivary samples were collected prethreat, postthreat, and posttask. The results suggest that ingroup threat was associated with increases in cortisol levels. Threatened participants who displayed LIB showed higher cortisol levels than those who were threatened and did not show LIB. These findings illustrate the importance of incorporating a neuroscientific approach.

Keywords

prejudice, outgroup derogation, intergroup threat, stress biomarker, cortisol, social identity theory, intergroup anxiety model, social neuroscience

Within social psychology, there has long been an interest in the study of social identity and intergroup relations (e.g., Allport, 1954; Hewstone, Rubin, & Willis, 2002; Tajfel & Turner, 1979). Typically, research in this area incorporates empirical work on attitudes,

¹University of Ottawa, Ottawa, Ontario, Canada

²Concordia University of Edmonton, Edmonton, Alberta, Canada

Corresponding Author:

Sinthujaa Sampasivam, University of Ottawa, School of Psychology, Vanier Hall, 136 Jean Jacques Lussier, Room 5045, Ottawa, ON K1N 6N5, Canada.

Email: ssamp041@uottawa.ca

cognitions, and behaviours in intergroup settings, and uses a mix of observational, behavioural, and self-report measures. More recently, neuroscience methods have been applied to this area of inquiry. Social neuroscience is an interdisciplinary field that integrates theories and methods in social psychology and biology to inform, refine, and elaborate on theories on intergroup behaviour and processes (Cacioppo & Cacioppo, 2013; Cikara & Van Bavel, 2014).

One area of intergroup research that lends itself directly to such an approach pertains to reactions to intergroup threats (Scheepers, 2013). Perceptions of threat are associated with stress (Cheon & Hong, 2016; Stephan & Renfro, 2002) and will typically result in actions meant to restore comfort and security. One such action is the verbal expression of outgroup biases (e.g., Bourhis & Maass, 2005; Collins & Clément, 2012; Fiedler & Schmid, 2001; Wigboldus, Spears, & Semin, 2005). It is not, however, entirely clear whether verbal derogation will have restorative functions. Sampasivam, Collins, Bielajew, and Clément (2016) found that the opportunity to verbally retaliate enhanced physiological stress. This study aims to further our understanding by assessing physiological reactions associated with the actual use of derogation via subtle lexical choices.

Social Identity Theory Perspective

Social identity comprises an important component of one's self-concept, used to both derive meaning about and to evaluate oneself (Tajfel & Turner, 1979). Social identity can be based on sexual orientation, ethnicity, a common hobby, and so on. It represents more than mere group membership resulting from categorization and indicates actual motivation to define oneself based on group membership (Brewer, 2001). The more one identifies with the ingroup the more central that identity becomes to the self, and the more the group's welfare affects the member's welfare (for a review, see Brewer, 2007). Identification with groups that are highly valued in society helps group members maintain a positive self-identity. Consequently, group membership promotes behaviours that advance that group's interests and goals.

Some researchers have focused on contexts in which social identity is undermined, that is, in contexts that are threatening (Branscombe, Ellemers, Spears, & Doosje, 1999). Threat is defined as the actions or beliefs of an outgroup that challenge the group's goal attainment or well-being (Riek, Mania, & Gaertner, 2006). The nature of these threatening contexts can vary; it can range from circumstances in which one belongs to a stigmatized group (e.g., being denied a promotion based on race or size), to situations in which preferred sports teams or political parties lose. Threat is considered to be a key motivational variable in social identity research (Branscombe, Ellemers, et al., 1999; Ellemers, Spears, & Doosje, 2002).

Various theories and taxonomies on intergroup threat explore how different forms of threats interact with ingroup identification to influence attitudes and behaviours towards the outgroup (e.g., Branscombe, Ellemers, et al., 1999; Riek et al., 2006). Integrated threat theory (ITT: Stephan & Renfro, 2002; Stephan & Stephan, 2000; Stephan, Ybarra, & Morrison, 2009) proposes that threats can be categorized

into realistic and symbolic threats. The former relates to threats to the political and economic power of the group, the group's physical welfare, and its very existence, while the latter relates to threats to the group's value and belief systems, world view, and so on. ITT argues that threats lead to negative psychological reactions (e.g., prejudice) and behavioural reactions (e.g., aggression) against the outgroup, as well as other consequences such as negative emotions and stress. Stephan and Renfro (2002) report evidence supporting a relationship between threat and prejudice from both correlational and experimental studies with a wide range of target groups. Similarly, a meta-analysis studying the impact of intergroup threats on outgroup attitudes showed that threats are indeed negatively related to outgroup attitudes (Riek et al., 2006). Perceptions of intergroup threat may relate to negative outgroup attitudes, given that experiencing an intergroup threat is a stressful and anxiety-provoking experience (see Stephan et al., 2009). Thus, it may motivate group members to engage in different strategies to alleviate it (Hogg & Abrams, 1990; Yzerbyt & Demoulin, 2010). One such strategy is outgroup derogation (Tajfel & Turner, 1986), described as treating or viewing the outgroup with negativity or hostility. Outgroup derogation may take both implicit and explicit forms.

Intergroup theories help explain why people might experience stress when perceiving a threat to their identity, and what purpose engaging in outgroup derogation would serve. According to social identity theory (SIT) and research under its paradigm (e.g., Maass, Cadinu, Guarnieri, & Grasselli, 2003), outgroup derogation is one strategy used in the face of a group-based threat to bolster and protect social identity. This finding has been observed in a number of intergroup contexts. For example, when ingroup American identity was threatened, those with higher ingroup identification showed reduced self-esteem, which then predicted engagement in derogation (Branscombe & Wann, 1994). As expected, engaging in derogation was later associated with increases in self-esteem. Similar results have been found in diverse intergroup contexts (Bourhis, Giles, Leyens, & Tajfel, 1979; Branscombe, Schmitt, & Harvey, 1999; Knobloch-Westerwick & Hastall, 2010; Maass et al., 2003). Overall, past research suggests that perceptions of threat that negatively affect self-esteem or identity can be bolstered by engaging in outgroup derogation. Hence, according to SIT, outgroup derogation functions as a restoration mechanism.

Model of Intergroup Anxiety Perspective

Not all theories of intergroup interactions would, however, make these predictions. Research based on the model of intergroup anxiety (MIA; Stephan & Stephan, 1985) suggests that intergroup contexts can be anxiety inducing, especially when the intergroup nature of the contact is made salient. The MIA proposes that majority group members feel anxious, stressed, or uncomfortable in intergroup contexts from worry relating to psychological and behavioural consequences for the self, from being negatively evaluated by both ingroup and outgroup members, from appearing prejudiced, and so on. Behavioural, cognitive, and emotional consequences result from these feelings of anxiety. Behavioural consequences include

following norms more rigidly, cognitive consequences include biased information processing in favour of the ingroup, and affective consequences include transfer of the arousal from the initial feelings of anxiety to other emotions. Based on previous work showing that when ingroup members experience negative emotions or outcomes, negative evaluative responses of the outgroup are amplified (Blanchard, Adelman, & Cook, 1975), the MIA proposes that intergroup anxiety amplifies emotional responses both during interactions and afterwards during evaluations of the outgroup. In support of this model, there is evidence that anxiety triggers negative cognitions, which results in people relying on expectations and stereotypes when stressed, as well as being more likely to make unfavourable evaluations (Wilder & Shapiro, 1989a, 1989b). More recent research exploring anticipated intergroup contact showed that White participants who were told they would be interacting with a Black partner were more likely to report anxiety and were subsequently more likely to make negative evaluations of the outgroup (Amodio & Hamilton, 2012). Negative intergroup contact has also been found to increase the saliency of the contact partner's group membership, partially as a result of a lack of positive emotions associated with the contact partner (Paolini, Harwood, & Rubin, 2010). Taken together, these studies would suggest that the stress induced by intergroup threat would make group membership salient and would exacerbate negative evaluations of the outgroup and amplify negative emotions.

SIT and the MIA in this study are framed as making diverging predictions on why people engage in outgroup derogation. According to SIT, outgroup derogation is a regulatory mechanism through which positive regard is reestablished and stress diminished. Conversely, the MIA suggests that derogation makes the intergroup nature of the context more salient, causing negative emotions to be amplified and stress levels to increase. Thus, while both theories suggest that derogation is brought on by threat, the MIA would predict that derogation would not diminish stress levels.

Linguistic Intergroup Bias as a Means of Derogation

The mode by which derogation is performed may have an impact on its eventual outcome. Language is considered to play a key role in the formation, transmission, and maintenance of beliefs within a group, and allows for biased beliefs to be shared (Bourhis & Maass, 2005; Collins & Clément, 2012). Biased language can be presented in very obvious and intentional ways, for example, through the use of slurs or metaphors, and also in subtle, spontaneous, or even unconscious ways, for example, through word order, pronoun use, and language abstraction (Maass, Arcuri, & Suitner, 2014). The linguistic intergroup bias model (LIB model: Maass, Salvi, Arcuri, & Semin, 1989) incorporates perspectives on social identity, language, and derogation to theorize when people are likely to demonstrate biased views in a subtle manner. LIB proposes that subtle and implicit forms of linguistic bias contribute to the pervasiveness and ubiquitous nature of biased beliefs within society. It thus is a valuable paradigm through which we can study the relationships of interest. Moreover, given that more blatant or explicit forms of derogation are against current social norms, it is fruitful to

consider subtle forms of derogation (Dovidio & Gaertner, 1996; Hogg, 2013; Maass, 1999; Wenneker & Wigboldus, 2008).

The LIB model relies on the linguistic category model (Semin & Fiedler, 1988) to show how the same behaviour can be coded at four different levels of linguistic abstraction. Descriptive action verbs are the most concrete; they provide a neutral, verifiable, noninterpretable description of an observable behaviour (e.g., A punches B.). Interpretive action verbs provide an interpretable description of a behaviour that refers to a general class of behaviours (e.g., A hurts B.). State verbs do not make a concrete reference to a specific behaviour. Rather, they refer to Person A's psychological state with regard to Person B (e.g., A hates B.). Adjectives are the most abstract, and describe enduring dispositions of a person; they are generalizable across situations and behaviours (e.g., A is aggressive.). Language varying in levels of abstraction has very different implications. Generally, describing behaviour in more abstract terms suggests that a behavioural episode is linked to an actor's disposition or behavioural tendency, while describing behaviour in concrete terms suggests that it is an isolated event that does not necessarily reflect an actor's enduring characteristics (Semin & Fiedler, 1988). More recently, researchers have argued that nouns should be included as a fifth level of abstraction (see Maass et al., 2014) and, compared to adjectives, have been found to provide more information about the person and describe more enduring and central characteristics of the individual, as well as make more predictions about future behaviours (Carnaghi et al., 2008).

According to the research conducted on LIB, there are systematic differences in descriptions of the same behaviour depending on the actor's group membership (Maass et al., 1989). Specifically, research under the LIB paradigm has demonstrated that positively valenced behaviours from the ingroup and negatively valenced behaviours from the outgroup are described abstractly (e.g., "The ingroup member is helpful" and "The outgroup member is aggressive"). Conversely, negatively valenced behaviours performed by the ingroup and positively valenced behaviours performed by the outgroup are described with less abstraction or more concreteness ("The ingroup member punches someone" and "The outgroup member opens the door for someone") (Maass et al., 1989). Thus, positive features of the ingroup are emphasized through the use of higher levels of abstraction to describe them compared to negative features, while the opposite is true for the outgroup (Moscatelli & Rubini, 2011; Rubini, Menegatti, & Moscatelli, 2014). The LIB phenomenon's robustness is evidenced by its presence in both controlled experimental paradigms and studies looking at naturally occurring language production, as well as in varied linguistic, cultural, and intergroup contexts (Maass, 1999; Wenneker & Wigboldus, 2008).

Of particular interest to this study is research showing that the motivational state of communicators affects language use (Wenneker & Wigboldus, 2008), even when speakers are unaware of the biases present in their language use (e.g., Franco & Maass, 1996; Maass, 1999). For example, in intergroup contexts involving ingroup threat, ingroup protective motives can result in biased language use (Maass, Ceccarelli, & Rudin, 1996). In line with SIT (Tajfel & Turner, 1979), research on LIB has shown that when the ingroup identity is threatened, biased language, as a form of outgroup

derogation, helps maintain a positive ingroup image (Maass et al., 1996). Research utilizing LIB has also demonstrated the effectiveness of using an implicit instrument to assess bias in contexts in which norms against explicit forms of bias exist (Franco & Maass, 1999). Implicit and explicit bias measures were found to correspond for groups that do not have normative protection against discrimination (e.g., Islamic fundamentalists) but not for groups that do (e.g., Jewish people). These findings suggest that participants provided socially acceptable responses for the explicit measures when there was a normative pressure not to discriminate. Overall, these studies demonstrate that in the face of a threat-inducing intergroup context, people can implicitly, and unintentionally, derogate to achieve certain goals (Maass, 1999). Moreover, they reveal the advantages of using implicit measures of bias (Hogg, 2013; Maass, 1999; Wenneker & Wigboldus, 2008) to gain insight into a speaker's attitudes and attributes. Employing physiological measures of stress can further elucidate the relationship between these variables.

The Stress Response

Stress can be defined as the feeling of not having sufficient resources to deal with an event (Lazarus & Folkman, 1984). In particular, psychological factors, such as the perceived unpredictability or uncontrollability of an event, as well as factors such as expecting negative psychological or physiological consequences, will together determine whether a stress response will be activated (Kudielka, Hellhammer, & Kirschbaum, 2007).

According to the allostasis model, a stressor may trigger the secretion of various hormones through the hypothalamic-pituitary-adrenal (HPA) axis, a major endocrine system, which principally regulates the stress response via the hormone cortisol. These sequential secretions allow blood sugar levels to remain steady in order to cope with the stressor, while also ensuring that the body is able to function and meet the need for increased attention, energy, and so on, and eventually return to homeostasis (Schulkin, McEwen, & Gold, 1994). Salivary cortisol is typically used to assess HPA functioning; it is a noninvasive method of collecting cortisol and correlates well with blood levels of the hormone (Vining, McGinley, & Symons, 1983).

Intergroup Threats and Physiological Stress Response

Recent work by Clément, Bielajew, and Sampasivam (2016) draws attention to the advantages of applying social neuroscience methodology in intergroup research. Scheepers (2013) notes how threat has seldom been directly measured in the extensive literature on threat and identity and has rather been inferred on the basis of, for example, lowered self-esteem or other outcome variables. With social neuroscience methodology, it is also possible to directly measure the variables of interest, without them being subject to controlled processes or self-presentation concerns (Blascovich, 2000; Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001; Cacioppo, Tassinary, & Berntson, 2000; Scheepers, Ellemers, & Derks, 2013; Scheepers, Ellemers, & Sintemaartensdijk, 2009).

The link between intergroup threats and self-reports of stress has been inconsistent, resulting in some researchers (e.g., Schmader, Johns, & Forbes, 2008) arguing that physiological measures might provide a better evaluation of threat-induced stress and are necessary to move this area of research forward (Scheepers et al., 2013). Moreover, the use of a multimethod approach, in which both self-report and physiological data are used to inform each other, would enhance interpretation (Mendes, Major, McCoy, & Blascovich, 2008; Mendoza-Denton & Page-Gould, 2013) and make it possible to compare competing theories, which could not occur with the use of only observational data or self-report measures (Ochsner & Lieberman, 2001).

Within this area of research, cardiovascular and neuroimaging techniques have most frequently been used (e.g., Amodio, 2009, 2013, 2014). A meta-analysis based on a sample of 134 studies that largely measured stress through cardiovascular indicators showed that perceived discrimination is associated with significantly heightened stress responses (Pascoe & Smart Richman, 2009). Generally, experimental research with various groups and different forms of intergroup threat supports this relationship (e.g., Blascovich, Mendes, et al., 2001; Blascovich, Spencer, Quinn, & Steele, 2001; Clark, Benkert, & Flack, 2006; Lepore et al., 2006; Mendes, Blascovich, Lickel, & Hunter, 2002). Cheon and Hong (2016) argue that this is because perceptions of threat, a subjective experience characterized by sentiments of anxiety, fear, and uncertainty stemming from basic psychological needs being thwarted, induces adaptive responses at social, psychological, and neurobiological levels.

In the limited intergroup research incorporating HPA axis measures, cortisol has been used as an indicator of stress. For example, these studies have demonstrated that experiencing a threat to identity results in increased cortisol levels (Matheson & Cole, 2004; Townsend, Major, Gangi, & Mendes, 2011). In a study examining the association between threat due to anticipated interactions with outgroup members, prejudice, and HPA reactivity, the findings demonstrated that participants who showed an increase in cortisol after anticipating contact with outgroup members were more likely to show subtle and blatant prejudice (Bijleveld, Scheepers, & Ellemers, 2012). The authors suggest that increases in cortisol levels and expressions of prejudice have similar features; they are both proposed to have restorative functions.

Sampasivam, Collins, Bielajew, and Clément (2016, 2018) examined the interaction between perceiving a threat to the ingroup, an opportunity to derogate the outgroup, and physiological stress response. In their studies, Euro-Canadian students were asked to read discriminatory (threat condition) comments Chinese people had made about Canadians. Subsequently, participants were placed in a condition in which they either had an opportunity to derogate against Chinese people or had no such opportunity. Salivary cortisol and alpha amylase, both indicators of physiological stress, were measured at baseline, following the threat, and following the opportunity to derogate. In the case of cortisol, an ingroup threat was associated with an increase in salivary cortisol concentrations (Sampasivam et al., 2016). Moreover, for those who were threatened, having an opportunity to retaliate against the outgroup was associated with more stress. In the case of alpha amylase, participants only showed a delayed

response to stress, and having an opportunity to derogate did not affect alpha amylase levels (Sampasivam et al., 2018). What is clear from these results is that intergroup threats can result in a physiological stress response in an experimental setting, which supports the use of biological markers in understanding the relationship between threats and outgroup derogation.

The Present Study

The studies described above did not consider whether threatened participants actually engaged in derogation when given the opportunity to do so, and thus it is unclear what exactly led to the stress response. Hence, the present study expands on previous work by including an LIB task as a means of derogation. With the use of this implicit measure, it is possible to compare participants who did and did not engage in derogation given the opportunity, and those who were in the control condition and had no such opportunity.

Specific Hypotheses

Hypothesis 1: Based on previous research (e.g., Matheson & Cole, 2004; Sampasivam et al., 2016), we predicted that exposure to an intergroup threat would increase salivary cortisol levels, while exposure to nonthreatening intergroup text would result in no changes to salivary cortisol.

Hypothesis 2: We also hypothesized that threat and LIB would interact so that among participants showing LIB, threatened participants would show significantly higher cortisol levels compared to those who were not threatened.

Hypothesis 3: Given our earlier findings (e.g., Sampasivam et al., 2016) and following an MIA perspective, we expected that threatened participants who display LIB would show higher cortisol levels than threatened participants who did not show LIB or were in the control condition.

Method

Overview

In this study, social identity was used to create a group-based symbolic threat (Stephan et al., 2009; Stephan & Renfro, 2002; Stephan & Stephan, 2000) or threat to group value (Branscombe, Ellemers, et al., 1999). This form of threat questions the integrity of the group's meaning system and is related to loss of face, undermining self-esteem or ingroup identity (Stephan et al., 2009). To establish an intergroup context with symbolic threats, participants read about research on the similarities and differences between Chinese and Canadian cultures. The research focusing on the differences provided a symbolic threat and questioned Canadian work habits, family structure, hobbies, and values.

Participants

The experimental protocol called for creating a situation in which participants would feel threatened. To that extent, the materials had to target a very specific group, in this case, Canadians. It was, therefore, important that participants were clearly affiliated with the Canadian group and were also well aware of the stereotypes associated with being Canadian. Thus, only participants who met the following criteria were recruited: (1) born in Canada, (2) parents were born in Canada, (3) mother tongue was English, and (4) exclusively self-identify as a Caucasian Canadian. Participants were told that mother tongue referred to the first language learned and still most frequently used. A total of 172 undergraduate students (26 males and 146 females) who were enrolled in introductory psychology courses participated in exchange for course credit. This discrepancy between the number of male and female participants will be addressed in the Discussion section. The average age of participants was 19.07 ($SD = 2.81$) years. This study received ethical approval from University of Ottawa's Social Science and Humanities Research Ethics Board. Informed consent was obtained from all participants.

Measures

Salivary Cortisol. Saliva samples were collected three times. Participants placed an oral swab underneath their tongues for 3 minutes. To extract cortisol, enzyme-linked immunosorbent assay kits commercially available from Salimetrics Inc. were used. The samples were assayed in duplicate, and the average concentration was used for data analyses. Intra-assay variability was 13.91%, and inter-assay variability was 8.06%.

Outgroup Derogation. Participants were randomized into conditions in which they had the opportunity either to engage in a linguistic task that would allow outgroup derogation or to complete the control task. Participants in the condition in which they could respond to the LIB task were in the opportunity to derogate condition, while those in the control task were in the no opportunity to derogate condition. 34.8% of participants were in the control condition, while 65.2% of participants were in the LIB condition. Given that not all participants in the LIB condition would engage in derogation, more participants were randomized into the LIB condition.

In the control condition, participants were given 10 minutes to write a paragraph on time management. In the opportunity to derogate condition, participants responded to a linguistic task that consisted of reading and rating 16 vignettes. These were part of a set of 32 vignettes that were pilot tested prior to the study on a similar group of participants. The latter rated the extent to which the scenarios were typical of North Americans and Asians, and whether they really did describe positive and negative behaviours. Scenarios that were rated as being above at least 85% socially desirable or socially undesirable and were judged as significantly more typical of either Asians or North Americans were included in the study.

Of the 16 retained vignettes, 8 depicted socially desirable behaviours (e.g., giving a present) and 8 depicted socially undesirable behaviours (e.g., fighting). Eight of the vignettes (four desirable and four undesirable) described ingroup members (Caucasian), and the remaining eight described outgroup members (Chinese). The sex of the actors performing the behaviour varied so that eight of the vignettes contained males and eight contained females. The 16 vignettes were balanced across conditions, and the order of their presentation varied systematically.¹ Participants were asked to read the vignettes and choose the response alternative that, in their opinion, described the behaviour of the main character most accurately. The following is an example of a socially desirable vignette describing an episode involving an Asian character:

Yanling Li, a woman, is buying some items at a convenience store. The cash register is broken so the clerk apologetically asks her to return later to purchase the items. However, Yanling Li is able to mentally calculate that she owes the clerk \$23.87. She is able to purchase the items on the spot.

Participants then chose one of the following response alternatives (1) Yanling Li calculates her total, (2) Yanling Li avoids returning to the store later, (3) Yanling Li feels competent, and (4) Yanling Li is intelligent. The response alternatives for each vignette were randomized and corresponded to a level of abstraction in the LCM (Semin & Fiedler, 1988). Participants received higher scores for choosing more abstract descriptions (descriptive action verb = 1, interpretive action verb = 2, state verb = 3, adjective = 4; Semin & Fiedler, 1988).

Procedure

Participants who met the inclusion criteria were invited to attend a lab session at 3 p.m., 5 p.m., or 7 p.m., when cortisol concentrations are near their lowest values and the diurnal function relating time to cortisol concentration is relatively flat (Kirschbaum & Hellhammer, 2000). The study lasted approximately 90 minutes. Only participants who woke up at or before 9 a.m. were included in the study. Participants were randomly assigned to the different threat conditions. The design of the experiment, including the flow of participants through each stage of the experiment and assignment into different conditions, appears in Figure 1. A customized survey was used to ensure that saliva samples were collected at baseline, 20 minutes after participants read the threat manipulation, and 20 minutes after engaging in the LIB or control task.

Before starting the experiment, participants were asked to rinse their mouths with water to help remove food residue and increase hydration. They subsequently watched a video demonstrating how to provide saliva samples, and completed a demographic questionnaire as well as questions about engaging in behaviours that could potentially affect cortisol concentrations. These included questions about having any major meals, fluids, or cigarettes an hour before the start of the study, alcohol and medication 12 hours prior to the start of the study, any recent major dental work, and whether their gums bled when they brushed their teeth that morning. These tasks took at least 15 minutes.

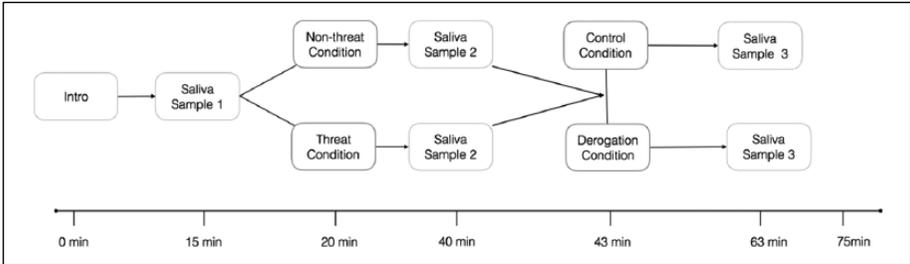


Figure 1. Flowchart demonstrating participants in the two groups—no threat (top) and threat (bottom), moving through the different stages of the study.

Participants then provided a baseline saliva sample (labelled “Saliva Sample 1”). Subsequently, they were randomized either into the threat or nonthreat condition. Participants in both conditions were presented with information from past psychological studies investigating the similarities and differences in work habits, family structure, hobbies, and values between Canadians and Chinese individuals. Those in the threat condition received a symbolic threat or threat to group values and belief systems (Branscombe, Ellemers, et al., 1999; Stephan et al., 2009; Stephan & Renfro, 2002; Stephan & Stephan, 2000). These participants were told that Chinese interviewees admitted to the existence of fundamental differences in values and behaviours, among other things, between Canadians and Chinese, and had made a number of discriminatory statements about Canadians. Participants were then presented with some excerpts from the interview transcripts. An example of an excerpt from the threat condition was “There is no ‘Canadian’ culture—that’s why they want to keep the French in—it’s the only thing that separates them from the States and makes them interesting. . . . ‘Canadian culture’ is such a joke.” In the nonthreat condition, participants were told that Chinese interviewees focused on the similarities between both cultures and made a number of favourable statements about Canadians. For example, participants in the nonthreat condition read,

I heard Canada was supposed to be one of the most, uh, multicult . . . yeah, multicultural places in the world. It is so true. People were so nice to me and helped me out so much. They didn’t care that I wasn’t from here.

Participants then provided a second saliva sample (labelled “Saliva Sample 2”), which was collected 20 minutes following the threat. In between saliva sample collections, participants engaged in a filler task that was meant to keep the threat manipulation salient. The filler task involved summarizing their understanding of the research on Canadian and Chinese individuals, as well as responding to questions about the research they had just read, for example, if Chinese interviewees perceived similarities or differences between Canadians and Chinese. Participants were randomized into conditions in which they either had the opportunity to engage in a linguistic task—reading and rating the vignettes described above—that would give them the possibility to derogate against

the outgroup or to complete the control task. Twenty minutes following this task, participants provided a third saliva sample (labelled "Saliva Sample 3"). During this 20-minute period, all participants engaged in another filler task in which they watched a short film called *New Boy* and a clip of the show *What Would You Do*, both involving more stressful intergroup contact at first and then more positive intergroup contact. In compliance with ethics regulations, participants were debriefed about the manipulation involved in the study. Saliva samples were centrifuged and stored in a -80°C freezer until they were assayed.

Results

Manipulation Check

To determine whether the threat manipulation was perceived as expected, a pilot study with an independent sample of 22 participants (20 females and 2 males) was carried out. The participants' average age was 20.59 ($SD = 5.62$) years. They were asked to read either the threatening or the nonthreatening composition and then respond to a scale with 10 items. The scale included four items (threatening, offensive, ignorant, and disagreeable) that measured perceptions of threat ($\alpha = .88$) and six items (congenial, inoffensive, soothing, pleasant, agreeable, and positive) that measured inoffensiveness ($\alpha = .96$). Participants responded on a 5-point scale that ranged from *not at all* (1) to *completely* (5). An independent-samples *t* test was carried out to compare the effect of reading either the threatening or nonthreatening composition on feeling threatened. Results showed that those who read the threatening text were significantly more likely to perceive the text as threatening ($M = 2.98$, $SD = 1.044$) compared to those in the nonthreat condition ($M = 1.63$, $SD = 0.780$), $t(20) = 3.473$, $p = .002$. An independent-samples *t* test also compared the effect of reading either the threatening or nonthreatening composition on perceiving the composition as inoffensive. Compared to those in the threat condition ($M = 1.67$, $SD = 1.091$), participants in the nonthreat condition were significantly more likely to perceive the text as nonthreatening ($M = 3.68$, $SD = 0.702$), $t(20) = 5.236$, $p < .001$.

Confounding Variables

The effects on cortisol secretion of wake-up time on saliva collection day, use of birth control in 12 hours prior to testing, number of days since the last menstrual cycle, and time of participation were considered. Across groups, wake-up time ranged from 5 a.m. to 9 a.m. with no group difference, $F(1, 168) = 0.178$, $p = .674$; 12 participants took birth control pills 12 hours prior to testing, a few in each group, and there was no significant group difference in the number of days since their last menstrual period, $F(1, 141) \leq .001$, $p = .997$. We also considered whether the time at start of participation (3 p.m., 5 p.m., or 7 p.m.) would impact baseline cortisol levels. No group differences were found, $F(1, 165) = 1.030$, $p = .462$. Of our participants, 95 reported having close Chinese friendships, while 73 reported having none. There was no impact of

close friendships on cortisol secretions, $F(1, 168) = 0.570, p = .451$. A total of 41 participants, were, however, disqualified due to bleeding gums and late rising that morning.

Main Analyses

To test our main hypotheses, both area under the curve with respect to ground (AUC_g) and area under the curve with respect to increase (AUC_i) were used as the summary measure of change based on trapezoidal rule from ground (Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003). Area under the curve (AUC) is a mathematical integration metric that has been used for several decades in pharmaceutical and medical research to assess total drug exposure over time, for example. The metric has been popularized in endocrine studies for integrated assessments of various biomarkers, especially useful in studies employing serial collections of hormones, etc., thus providing a summary statistic of repeated data and simplifying the overall statistical analysis. Pruessner et al (2003) describe in detail the two uses of AUC, a measure of total output or release, referred to as AUC with respect to ground (AUC_g) and change over time or sensitivity of the endocrine system, referred to as AUC with respect to increase (AUC_i). According to Reinhard and Soeder (2001, as cited in Pruessner et al., 2003), both can be derived from trapezoidal formulae. These two formulae target different characteristics of the data. In this study, we elected to assess both AUC_g and AUC_i, based on arguments proposed by others (Aloia & Solomon, 2015); we report the results of both analyses below.

Effect of threat on AUC_g and AUC_i. A one-way analysis of variance was conducted with threat (present or absent) on the AUC_g and AUC_i of Saliva Samples 1 and 2 (see Figure 2 showing AUC_g results). Both resulted in a significant effect of threat, AUC_g $F(1,169) = 3,686, p = .050, \eta^2 = .022$; AUC_i $F(1, 165) = 8.520, p = .004; \eta^2 = .052$. Supporting the first hypothesis, participants who were threatened showed a greater increase in AUC values compared to those who were in the nonthreat condition.

Linguistic Bias. To differentiate participants who showed linguistic bias from those who did not, an index of linguistic bias was calculated (Maass et al., 1996). As will be recalled, for each vignette, the participants chose one of four descriptions of the main character ranging from concrete (rated 1) to abstract (rated 4). Using these ratings, first, four average abstraction ratings were calculated, respectively, for outgroup positive, outgroup negative, ingroup positive and ingroup negative vignettes. Second, for vignettes pertaining to ingroup members, the mean of ingroup negative behaviours was subtracted from the mean of ingroup positive behaviours. In the case situations involving the outgroup, the mean of outgroup positive behaviours was subtracted from the mean of outgroup negative behaviours. Third, these differences were summed to create an overall LIB Index, which ranged from -2 to 2.50 ($M = -.186, SD = .815$). Higher scores were indicative of greater linguistic bias.

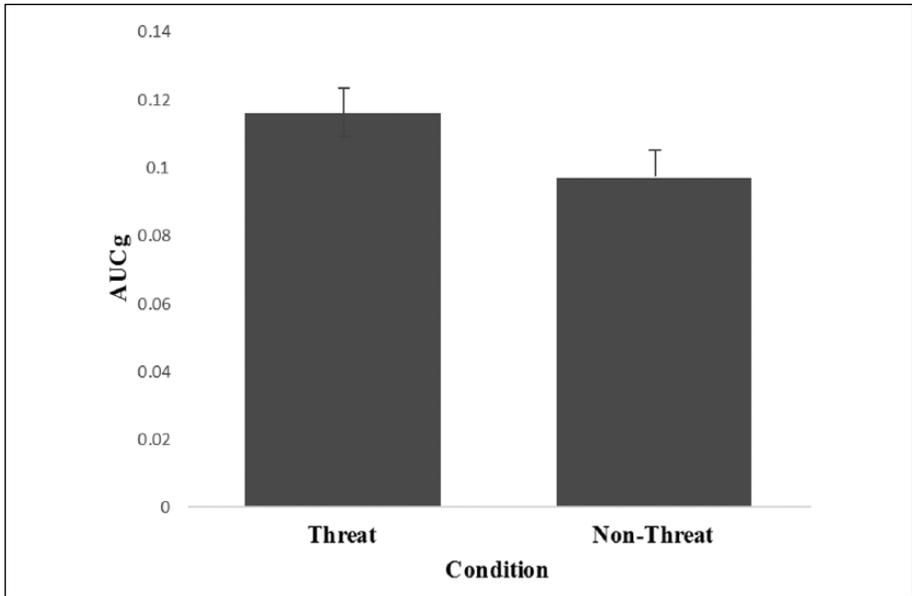


Figure 2. Mean AUCg (\pm SEM) of cortisol concentrations of saliva Samples 1 and 2 as a function of condition—threat or nonthreat, on the left and right sides, respectively. Note. AUCg = area under the curve with respect to ground; SEM = standard error of mean.

To differentiate participants who tended to show derogation (LIB group) from those who did not (no-LIB group), we first removed a further 16 participants who had an LIB score of zero. In the context of the current hypotheses, this ensured that all participants were clearly showing an LIB or no LIB tendency. Participants whose LIB Index scores were above zero were grouped together (LIB group, $n = 28$), while those whose scores were below zero were grouped together (no-LIB group, $n = 45$). There were 41 participants in the control condition, resulting in a final sample of 115. Thus, this categorical independent variable had three groups: control group, LIB group, and no-LIB group. Except for the control condition in which participants were about evenly split between threat/nonthreat groups, the distribution of participants in the no- and high-LIB groups was biased towards the threat group, with a roughly 70/30 split.

Relationship Between Categorical Independent Variables. The chi-square test for independence was used to study the relationship between the threat groups and whether participants were in the LIB group or no-LIB group. The relationship between these variables was not significant, $\chi^2(1, N = 73) = .04, p = .847$. Hence, while participants were randomized into the threat and nonthreat conditions, participants were placed in the LIB or no LIB condition as a result of their responses to the linguistic task. The results of this chi-square analysis suggest that showing either some or no LIB was not an artefact of exposure to either the threatening or nonthreatening text.

Effect of Threat and Derogation on AUCg and AUCi. The first question of interest (Hypothesis 2) in these analyses was whether the combination of threat and LIB resulted in a greater salivary cortisol output (AUCg) and increase (AUCi) from Samples 2 to 3 compared to no threat and LIB. The second question (Hypothesis 3) was whether there was a difference in cortisol secretion between the no-LIB and LIB threat groups.

Planned comparisons between threat and nonthreat conditions in each of the LIB groups revealed that participants in the LIB group who were threatened were significantly more likely to have higher levels of cortisol compared to those who were not threatened (AUCg, $p = .030$; AUCi, $p = .050$), (see Figure 3 showing AUCg results) No such differences were found in the no-LIB and control, threat, and nonthreat groups, thus supporting Hypothesis 2, both with respect to total hormonal output and increase in cortisol.

Further analyses pertaining to Hypothesis 3 revealed significant differences in the AUCg of threatened participants who showed LIB compared to those who showed no LIB ($p = .042$), and just failed to meet criterion significance in the case of the control comparison ($p = .056$). The same analysis applied to AUCi, however, revealed no differences in the LIB versus no-LIB threatened groups. In the nonthreat condition, there were no significant differences between the AUCg and AUCi measures in any of the pairwise tests. These results support Hypothesis 2 and, partially Hypothesis 3.

Discussion

This research merges several areas of study to provide further understanding of the physiological underpinnings behind perceiving and responding to an intergroup threat. Based on previous work in our laboratory and that of others (e.g., Matheson & Cole, 2004; Sampasivam et al., 2016), we predicted that only participants who were threatened would show an increase in salivary cortisol levels. This hypothesis was confirmed by both the total hormonal output and increase measures of cortisol.

We also predicted (2) that among participants showing LIB, threatened participants showed significantly higher cortisol levels compared to those who were not threatened. Here, again, the data show that using the LIB when threatened results in increased cortisol output beyond what had been caused by the previous threat. Last, we predicted (3) that threatened participants displaying LIB would show higher cortisol levels than those who were threatened and did not show LIB or were in the control condition. In particular, we wanted to contrast SIT and the MIA to see whether engaging in bias would decrease or increase cortisol levels, respectively. Our findings indicated that threatened participants who engaged in LIB showed greater cortisol reactivity compared to threatened participants who did not engage in LIB and, as expected, participants who were not exposed to the threat. These effects were, however only obtained with the total hormonal measure and not the increase measure. While not detrimental to our conclusions, these results raise the possibility that the absence of a difference in increase may be due to a ceiling effect connected to such increase in the current context of a relatively mild threat.

Generally then, our findings did not support our predictions derived from SIT. Rather, they supported our expectations based on the MIA. In particular, participants

who were threatened and, consequently, aroused continued to be so after engaging in LIB. They suggest that threatened participants who chose biased descriptors favouring the ingroup and derogating the outgroup showed greater physiological stress compared to those who were threatened and chose not to engage in bias. Previous studies have demonstrated that engaging in derogation in the face of ingroup threat can help bolster identity and self-esteem (e.g., Branscombe & Wann, 1994; Fein & Spencer, 1997; Knobloch-Westerwick & Hastall, 2010; Lemyre & Smith, 1985). While there may be identity- and self-esteem-related benefits to engaging in derogation, our findings suggest that physiological consequences should also be taken into consideration.

One such consequence of responding in a biased manner is that it increases physiological stress. Frequent activation of the stress response system has been associated with a number of negative health consequences, including interfering with disease course and increasing vulnerability to disease incidence (Munck, Guyre, & Holbrook, 1984), as well as declines in cognitive functioning (Seeman, McEwen, Singer, Albert, & Rowe, 1997). Previous research with African Americans on stereotype threat and blood pressure has documented how African Americans under such threat showed greater mean arterial blood pressure during an academic test and performed worse on more difficult questions (Blascovich, Spencer, et al., 2001). In a review of social psychological research on the relationship between intergroup relations and health disparities, the authors argue that both advantaged and disadvantaged group members' "expectations, assumptions, interpretations, actions, and reactions" add to the disparities in health outcomes and quality of treatment experienced (Major, Mendes, & Dovidio, 2013, p. 14). This indicates that there are severe consequences to experiencing and dealing with an ingroup threat.

SIT and the MIA are framed in this study as making diverging predictions. However, it is possible that both theories can work in conjunction to predict the consequences of derogation. In a threatening context, it is possible that engaging in outgroup derogation can elevate ingroup identity, while also increasing physiological stress. In particular, a task that permits outgroup derogation might help restore ingroup identity, while at the same time making salient the intergroup nature of the task, resulting in stress. This protocol did not permit the simultaneous assessment of identity strength and cortisol because of the potentially confounding effect of asking about identity on physiological stress. However, a correlational study by Shulman, Collins, and Clément (2011) suggests that for a subgroup characterized by low second language confidence, resorting to the LIB is related to lower ingroup identity strength (p. 324, figure 3). Furthermore, a more recent study following a protocol similar to the present study, but including a measure of ingroup identity, found conflicting evidence (Sampasivam & Clément, 2018). Identity was measured using Cameron's three-factor identity scale, which incorporates the three components of identity as stated in SIT: awareness of group membership, group evaluation, and group attachment. The findings indicated that participants who were threatened and did not engage in bias showed an increase in ingroup identification compared to threatened participants who did engage in bias. Thus, for threatened participants, engaging in derogation was not a restorative mechanism. Taken together with the results from the current study, these findings suggest

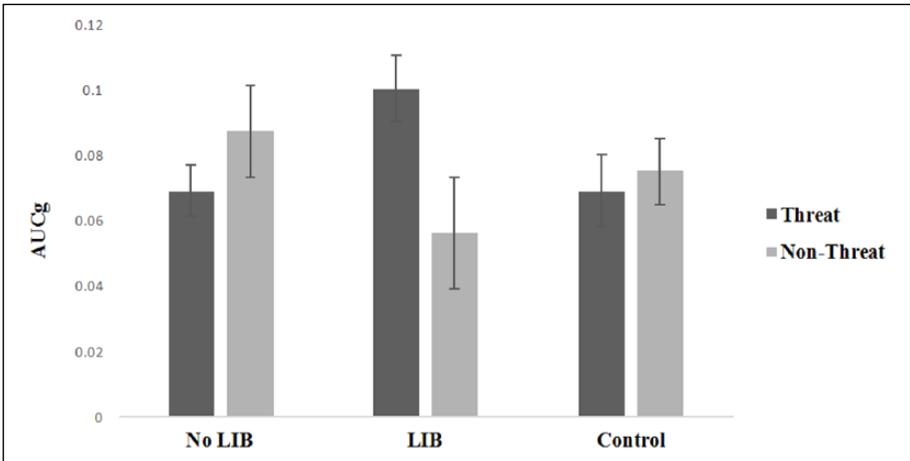


Figure 3. The AUCg of cortisol Samples 2 to 3 as a function of threat—with the two conditions, dark grey bars represent threat, and light grey bars represent nonthreat, as a function of derogation—with the No Lib on the left, LIB in the middle, and Control on the far right. Note. AUCg = area under the curve with respect to ground; LIB = linguistic intergroup bias.

that not only is engaging in bias associated with increased stress but it also does not have any identity-related benefits. Future research including both physiological indicators of stress while also assessing identity is necessary to further flesh out how SIT and the MIA align and differ.

This biomarker study featured the incorporation of the LIB paradigm. Linguistic bias is considered to be an implicit expression of bias, operating without one's conscious control, and thus is not subject to normative concerns (e.g., Franco & Maass, 1996; von Hippel, Sekaquaptewa, & Vargas, 1997). It has been argued that when using LIB, people may be aware that they are choosing more positive or negative alternatives to describe a group but might not be aware of or notice the subtle differences in response alternatives that are at higher levels of abstraction (Franco & Maass, 1996, 1999; Schmid & Fiedler, 1996; von Hippel, Sekaquaptewa, & Vargas, 1995, 1997). Given that threatened participants who showed higher levels of linguistic bias also showed more HPA axis reactivity, the findings suggest that even if participants are only implicitly engaging in what would be subtle bias, it nonetheless results in physiological stress. More research with other implicit instruments of bias is needed to elucidate if engaging in unconscious forms of bias can still have a physiological impact.

Previous work by Maass and colleagues (Maass et al., 1996; Maass et al., 2003) has documented how responding to threats by engaging in derogation helps bolster identity and self-esteem. Moreover, given that exposure to biased language results in the formation of corresponding beliefs (Collins, 2015), frequently responding to perceptions of threat via biased language use can have long-term societal implications. Specifically, biased language is a mechanism through which cultural beliefs are formed, shared, and

maintained. The use of biased language as a means of dealing with the stress resulting from perceptions of threat not only further increases stress levels and, as a result, affects health but also helps perpetuate those biased beliefs within a group.

In a recent review, Clément et al. (2016) argue that despite a strong rationale for studying intergroup communication from a social neuroscience perspective, there is only a limited amount of research in this area. In particular, research on intergroup communication has traditionally studied the link between psychological processes and communicative behaviours (for a review, see Giles & Harwood, 2018). However, given that language is a key biological component of human interactions and is found across cultures (Cappella, 1991), and given that current methodologies (e.g., self-report measures) in intergroup communications are not always able to distinguish between competing theories, it would be fruitful to employ a social neuroscience approach to better tie together this relationship and help extend the scope of the current research being conducted.

Several limitations in this study should be noted. First, the LIB task consisted of participants choosing a response alternative that they believed best represented the vignettes they read. Thus, participants' preferences were experimentally elicited, and it would be worthwhile to analyse the content of actual open responses, which may contain more complex biased communication. Third, the study sample consisted largely of young female university students and is not representative of the general population. Given that gender differences in LIB use have never been hypothesized or examined in the literature, we did not investigate any specific gender effects. It would be worthwhile to determine if there are gender-related differences in LIB use, considering there are gender differences generally in language use. Finally, disqualifying potentially confounding variables unexpectedly reduced cell size. Replication of this study with an awareness of these variables would, therefore, be recommended.

In summary, this study demonstrates how both perceiving a threat and engaging in bias in the face of threat are associated with physiological stress. Although there is extensive research suggesting that perceptions of threat are a key contributing factor to prejudice (Esses, Haddock, & Zanna, 1993; Riek et al., 2006) and a growing literature suggesting that psychosocial threats can elicit physiological stress responses, this is the first study to investigate the physiological consequences of engaging in such derogation. What is more, this outcome is the result of subtly different lexical and syntactic forms that have never been at the forefront of research on intergroup conflict.

Although research suggests derogating or retaliating against an outgroup can have restorative effects on identity and self-esteem (e.g., Branscombe & Wann, 1994), there is a physiological toll associated with it. Chronic exposure to intergroup threats might not only have long-term health consequences but also heighten anticipatory vigilance and sensitivity to intergroup experiences. This would result in attempts to regulate future experiences of threat, shape attitudes and behaviours towards the outgroup, and ultimately weave our very social fabric.

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Note

1. The vignettes are available on request from the authors.

ORCID iD

Sinthujaa Sampasivam  <https://orcid.org/0000-0003-4407-7993>

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Author Biographies

Sinthujaa Sampasivam completed her doctoral studies at the University of Ottawa. Her research interests relate to the social psychological and physiological consequences of dealing with intergroup threats.

Katherine Anne Collins is an assistant professor at Concordia University of Edmonton, Alberta, Canada, where she conducts research on the role of language in the transmission, maintenance, and formation of beliefs.

Catherine Bielajew is an emeritus professor in the behavioural neuroscience sector of psychology at the University of Ottawa. She has expertise in stress related biomarkers and health in human studies and using animal models.

Richard Clément is an emeritus professor of social psychology at the University of Ottawa. His research interests are related to intergroup communication, minority group relations, and second language acquisition.