

Study Proposal: How Conflict Exposure, Heat, and Socio-Contextual Factors Affect Aggression

The impact of heat on aggression has long been a subject of inquiry, captivating researchers and prompting exploration into the relationship between temperature and heightened emotional states. This curiosity is reflected in common expressions such as being "hot under the collar," getting caught up in "the heat of the moment," or being asked, "Can you take the heat?" Everyday experiences capture the association between uncomfortably high temperatures and emotions like violence and anger. My research aims to explore the scientific foundations of this phenomenon, to see whether or not existing evidence supports the connection between heat and aggression. Additionally, I intend to investigate alternative explanations for observed patterns. To achieve this, I will conduct a thorough review of relevant scientific literature, assessing what has been previously studied. After this, I will design and implement (SOMEDAY. I am not going to get in trouble with the IRB) my own study to address gaps identified in the existing research. My research seeks not only to contribute to our understanding of the relationship between heat and aggression but also holds the potential to shed light on emerging challenges posed by Climate Change. With the knowledge provided in this research, we can gain valuable insights that will inform strategies to mitigate and adapt to the consequences of a global increase in temperature.

The study of the effect that climate has had on human behavior has been studied for hundreds of years. Back in 1748, Baron de Montesquieu spoke at length about it in his book, *The Spirit of Laws*. One example in the text is "[t]he heat of the climate may be so excessive as to deprive the body of all vigour and strength. Then the faintness is communicated to the mind:

there is no curiosity, no enterprize, no generosity of sentiment; the inclinations are all passive...”
This is not a new phenomenon by any means.

In 1976, Robert A. Baron and Paul A. Bell conducted a study titled "Aggression and Heat: The Mediating Role of Negative Affect". The research involved sixty-four undergraduate male students who received either positive or negative evaluations of an unfamiliar person. Subsequently, they were allowed to provoke this stranger through electric shock. Research ethics, oh how we have evolved. Half of the participants experienced a cool and comfortable environment, while the other half endured a hot and uncomfortable one. The hypothesis proposed that individuals in the hot environment would exhibit aggression toward the stranger more frequently. The findings revealed that moderate levels of increased ambient temperatures tended to facilitate the occurrence of subsequent aggressive behavior.

In a separate study titled "Priming Effects of Heat on Aggressive Thought" published in 1987, researchers investigated the impact of aversive conditions on the activation of aggressive thoughts. Sixteen men and sixteen women were assigned to either a standard temperature condition (21°C) or a warm condition (33°C). Participants engaged in a task where they completed story stems, under the impression that the study focused on how environmental factors like noise, heat, and lighting might affect performance. Some story stems allowed for both aggressive and nonaggressive endings, while others were neutral and did not suggest aggression. The findings from this study revealed that individuals in the warm condition did not exhibit more aggressive content in neutral story stems compared to the standard-temperature group. The standard-temperature group displayed low levels of aggression in their completion of ambiguous stems. Conversely, the warm-temperature participants demonstrated significantly more negative emotions, frustrations, and aggression in finishing ambiguous story stems. These

results support the notion that exposure to challenging conditions can prime thoughts linked to aggression, making them more easily triggered by less noticeable cues.

In yet another study published in 1991 titled "Temper and Temperature on the Diamond: The Heat-Aggression Relationship in Major League Baseball", researchers gathered data from major league baseball games conducted in the 1986, 1987, and 1988 seasons. This data was analyzed to explore the correlation between game temperatures and the incidence of batters being hit by pitches. The findings revealed a positive and significant relationship between temperature and the frequency of hits per game, even after accounting for potential confounding variables unrelated to aggression. A similar pattern emerged in games played during the 1962 season. The observed relationship appeared to be linear, suggesting that elevated temperatures may prompt major league pitchers to adopt a more aggressive pitching approach toward batters.

The first hypothesis I will make in this paper is that there must be a correlation between scientists who study heat and aggression and jocks because I found yet another sport-related study titled: "A relationship between temperature and aggression in NFL football penalties". The objective of this study was to explore the established association between ambient temperature and increased physical aggression, focusing on the high-aggression setting of professional football in the National Football League (NFL; if you didn't already know that, you nerd). Utilizing a publicly available dataset comprising game-level data from 2326 NFL games, the researchers conducted multiple hierarchical regression analyses. The results demonstrated a positive correlation between temperature and aggressive penalties in football. This relationship was found to be significant for teams playing at home but not for visiting teams. The conclusion drawn from these findings suggests that, even within the inherently aggressive context of football, warmer weather contributes to an escalation of violent incidents. Furthermore, the

identification of the heat-aggression relationship primarily for the home team implies that the characteristics of interacting groups may play a role in determining whether heat exerts an adverse effect on the outcome of these interactions.

In an experimental investigation into the effects of high temperatures on police officer-suspect interactions in 1994, Dutch police officers were subjected to a video of a suspect while under two separate conditions: one with elevated temperatures (27 degrees Celsius) and another serving as a control scenario (21 degrees Celsius). Despite the similarity in the suspects' appearance and behavior across the temperature conditions, the study revealed that high temperatures influenced police officers' conduct and perceptions of the suspect. The findings showed that increased temperatures led to heightened negative affect and aggression among police officers. In the high-temperature setting, the suspect conveyed a more aggressive and threatening demeanor. Notably, the threatening impression emerged as a critical factor in predicting aggressive police behavior. This supports the notion of misattribution in police-suspect confrontations under high temperatures, where the suspect's perceived threat triggers aggressive responses. ACAB for real.

As the temperature of the world increases, researchers are more motivated to learn how the effect of a hotter environment will influence human behavior. This is with good reason. In *Quantifying the Influence of Climate Change in Human Conflict*, Solomon Hsiang looked at this from a statistical perspective and the results were clear, “[d]eviations from normal precipitation and mild temperatures systematically increase the risk of conflict.” This was concluded by using a statistical method to analyze 60 studies that “infer causal associations between climate variables and conflict outcomes”. The findings spanned time periods from 10,000 BC to when the study was published in 2013.

The study that led me to choose this line of research is titled Destructive Behavior, Judgement, and Economic Decision-Making Under Thermal Stress. The researchers were not only looking for the effect heat has on aggression but also the effect it has on decision-making and judgment. For my research, I will be focusing on the assessments related to destructive behavior. In this study, they had two “simultaneous and parallel” experiments running in both Kenya and California. In addition to controlling heat as a variable, the experimenters also wanted to test the effects on a population experiencing political strife (Kenya, in this case). They recruited students from the University of Berkeley and the University of Nairobi as the subjects and had “144 experimental sessions with 12 participants each”. The researchers randomly assigned subjects to either a hot or comfortable environment. Then, they had the subjects play multiple computer games. During the games, the participants could see how much money another player was making and choose to take that player's money away from them. They did not receive the money, they could only erase it from the other person's game. The results of this study found “a large and highly statistically significant effect of thermal stress on destructive behavior in both sites” that held up when controlling for the number of inferences made in the analysis. In Nairobi, participants chose to destroy the other players' earnings, an increase of about 50% in the heat group relative to the 14% in the control group. In California though, the results were the opposite. Players were less likely to take away earnings in the heat group.

In the conclusion of this study, the researchers said that “[i]t is possible that different results may be achieved if subjects are exposed over a longer duration to temperatures higher than 30°C” and “[i]t is also possible that other non-temperature stressors could similarly lead to increases in destructive and anti-social behavior among socially marginalized groups, and this remains a promising direction for future research”.

Researchers hypothesize that other climate change related elements (ie. drought, malnutrition, disease, overall despair, melted ice cream) can increase aggression. This would include the variation between the so-called politically unstable population in Kenya versus the comfort of the population in California explored in Destructive Behavior, Judgement, and Economic Decision-Making Under Thermal Stress. These would be considered “indirect mechanisms” according to Andreas Miles-Novelo and Craig A. Anderson in their book *Climate Change and Human Behavior*. When initially choosing my research topic, I planned to investigate the direct influence of heat on aggression. However, upon delving into existing research, I have come to believe that a more promising approach involves exploring the indirect mechanisms.

This shift in focus is motivated by a critical examination of the Kenya/California study, which, despite presenting compelling evidence, I find to have several errors that need addressing. The first issue is that Kenya and California are very different in terms of culture, economy, politics, and environment, raising the possibility that factors other than instability may account for variations in the impact of heat on aggression. Secondly, my investigation has revealed a lack of substantial evidence supporting the assertion of instability in Kenya, particularly within the academic setting at the University of Nairobi. Lastly, I hold the view that computer games are not the optimal method for assessing real-life aggression. Not to say gamers are not aggressive for we have all witnessed a League of Legends chat when they flame the Jungle. I just believe that they are too significantly dissimilar from real-life scenarios.

For my study, I have decided to make some major changes. I intend to designate conflict zones as areas in cities within the United States that experience strife, such as those impacted by gang violence. Then, I will have a stable zone that is a suburb or comfortable neighborhood

within the same city. These will be the areas I will draw my participants from. Demographic considerations will ensure the inclusion of individuals from diverse backgrounds, reflecting varying age groups, genders, and socioeconomic statuses. By doing so, I can investigate how environmental and socio-contextual factors interact in culturally similar regions, hopefully eliminating other potential variables in the study comparing Kenya and California.

The other major change I intend to make is using Virtual Reality (VR) instead of computer games to test aggression levels. I chose to use VR simulations because traditional experiments have limitations. Immersing participants in a virtual environment helps bridge the gap between lab studies and real-life situations, giving a more realistic representation of social interactions. VR provides a controlled yet immersive setting, letting participants navigate dynamic scenarios with experimental rigor. This approach improves the study's validity, capturing the complexity of human behavior in response to environmental stressors. Plus, after completing the study, I can use it to play Beat Saber.

Within the VR scenarios, participants will navigate a Black Friday shopping simulator, symbolizing heightened tensions and potential conflicts, and a normal shopping scenario representing a typical consumer experience. I selected these two scenarios because they share similar concepts, but one is notably more stressful than the other. This mirrors real-life situations that participants are likely to have experienced. Another important aspect of this study involves informing participants that avatars representing other shoppers in the VR scenarios are portrayed by fellow participants. I think this will lead participants to approach the scenarios more seriously and evoke a realistic level of empathy.

During the VR simulation, participants will encounter opportunities for aggressive, passive, and positive interactions with the avatars. Decision-making tasks will prompt

participants to choose between these different interaction styles in response to conflicts within the virtual environment. Resource allocation challenges within both conflict and neutral VR scenarios will further illuminate the participants' responses to stressors. I believe that having this wide range of choices will give us more data to work with and as a wise psychology professor named Ethan Ludwin-Peery once said, “[m]ake sure to use diverse scenarios, and the more data the better” or something along those lines.

Participants will experience controlled variations in temperature conditions, distinguishing between a high-temperature group subjected to elevated temperatures and a comfortable-temperature group exposed to baseline conditions. The high-temperature group will be in a room set at 30°C (or as I like to say it, 86°F. AMERICA). The comfortable-temperature group will be in a room set at 22°C (or about 72°F *insert bald eagle call here*). This manipulation allows for the isolation of the impact of elevated temperatures on social interactions within the VR scenarios.

For data collection, I will use a mixture of Qualitative and Quantitative data (just in case you didn't know, I can use big-boy science lingo). This will include observational insights into participants' behaviors during and after VR scenarios. I will also track the decisions made during the simulation. Following the VR scenarios, participants will exit the room, and I will provide them with a brief survey to allow them to express their feelings and experiences during the experiment. The analysis will explore the interactive effects of elevated temperatures and conflict stressors on participants' chosen interactions, highlighting patterns of aggression, passivity, and positivity in conjunction with the data provided by observation and self-reported aggression levels.

To conduct the initial study we will first recruit 120 participants from a city in Michigan with the highest violent crime rate per 100,000, and another 120 from a nearby city (with a similar population) with a much lower rate. The participants from each city will then be assigned randomly to either the heat group or the control group. Before entering the simulation all participants will be informed that the humanoid avatars are being controlled by other participants and that the goal of the experiment is to study the effects of temperature on decision making. Next, the participants from all four groups (heat-conflict city, control-conflict city, heat-stable city, control-stable city) will enter one of two scenarios: the Black Friday shopping scene, or the Regular shopping scene. They will be given a list of 10 items they need to retrieve in the store. In the Regular shopping scene, 5 VR avatars controlled by an AI will be programmed to retrieve items in the store such that the participant crosses paths with other people 5 times. The Black Friday shopping scene will increase the number of AI avatars to 30, and make the items more difficult to find. At the moment of these interactions, they can choose an aggressive, passive, or positive course of action. During the simulation, a researcher will observe both the participant's VR decisions and physical behavior. Afterward, we will conduct the exit survey and analyze both the Qualitative and Quantitative data collected.

I hypothesize multiple potential outcomes based on past research. First, heightened temperatures might lead to an overall escalation in aggressive behavior, regardless of the indirect mechanisms. This would confirm previous studies examining the correlation between ambient temperature and aggression, like the baseball and football studies. Second, a combination of elevated temperatures and living in areas of high conflict might lead to higher levels of aggression but living in comfortable environments might lead to less aggression, as seen in the Kenya/California study. Or, I may discover that temperature plays a minimal role. There could be

an entirely different explanation for the observed phenomenon in other studies and we could all just be silly goofy guys for taking up so much time and resources focusing on the wrong subject all these years. Whatever the outcome is, this research strives to provide insights into the connection between temperature, environmental stressors, and human behavior, contributing to our knowledge of potential consequences in the face of a warming world. Hopefully, with this knowledge, we can be better prepared to prevent or manage some of the damage inflicted due to climate change.

Works Cited

- Almås, Auffhammer, M., Bold, T., Bolliger, I., Dembo, A., Hsiang, S. M., Kitamura, S., Miguel, E., & Pickmans, R. (2019). *Destructive Behavior, Judgment, and Economic Decision-Making Under Thermal Stress*.
- Craig, C., Overbeek, R. W., Condon, M. V., & Rinaldo, S. B. (2016). A relationship between temperature and aggression in NFL football penalties. *Journal of Sport and Health Science*, 5(2), 205–210. doi:10.1016/j.jshs.2015.01.001
- Bell, & Baron, R. A. (1976). Aggression and Heat: The Mediating Role of Negative Affect1. *Journal of Applied Social Psychology*, 6(1), 18–30.
<https://doi.org/10.1111/j.1559-1816.1976.tb01308.x>
- Hsiang, Burke, M., & Miguel, E. (2013). Quantifying the Influence of Climate on Human Conflict. *Science (American Association for the Advancement of Science)*, 341(6151), 1212–1212. <https://doi.org/10.1126/science.1235367>
- Ludwin-Peery, E. (2023) Hampshire College, Psychology Independent Study.
- Montesquieu, C. (1748). Complete Works, vol. 1 The Spirit of Laws. T. Evans.
- Miles-Novelo, & Anderson, C. A. (2021). *Climate change and human behavior : impacts of a rapidly changing climate on human aggression and violence*. Cambridge University Press.
- Reifman, A. S., Larrick, R. P., & Fein, S. (1991). *Temper and Temperature on the Diamond: The Heat-Aggression Relationship in Major League Baseball*. *Personality and Social Psychology Bulletin*, 17(5), 580–585. doi:10.1177/014616729117501
- Rule, B. G., Taylor, B. R., & Dobbs, A. R. (1987). *Priming Effects of Heat on Aggressive Thoughts*. *Social Cognition*, 5(2), 131–143. doi:10.1521/soco.1987.5.2.131

Vrij, A., Van Der Steen, J., & Koppelaar, L. (1994). *Aggression of police officers as a function of temperature: An experiment with the fire arms training system. Journal of Community & Applied Social Psychology*, 4(5), 365–370. doi:10.1002/casp.2450040505