The New York University Integrative Psychology Review

Summer 2022 || Volume I || No. 2
New York University

Table of Contents

Acknowledgements

The New York University Integrative Psychology Review would like to thank its administrative director, Dr. Andrew Hilford, and its faculty advisor, Dr. Lawrence Ian Reed for their contributions.

Additionally, NYU IPR would like to thank the members of its editorial team for their work and dedication.

Finally, the journal would like to thank New York University for allowing NYU IPR to provide a platform for undergraduate students from various disciplines to contribute to the interdisciplinary field of psychology.

Statement of Purpose

The New York University Integrative Psychology Review is a publication seeking to help students across all disciplines work together under the umbrella of psychology by providing a peer-reviewed platform that fosters a collaborative learning environment. Psychology is an incredibly interdisciplinary field, and we believe that it deserves a forum that exemplifies this diversity.

NYU IPR aims to empower undergraduate students of all disciplines and fields to engage in both empirical research and literature review and facilitate discussion and inquiry within the domain of psychology. We believe that creating a strong foundational framework of research literacy and collaboration across multiple disciplines and fields of study at an undergraduate level is critical to foster a truly comprehensive understanding of psychology and its applications for future generations of researchers and academics.

Preface

Welcome to the 2nd issue of the NYU IPR!

Exchanging, sharing, and even debating topics, concepts, facts and figures is the fuel behind the forward momentum of any field. With this in mind, the New York University Integrative Psychology Review joins an illustrious history and membership. In the sciences, journals have for many, many years been the main communication tool for new ideas. It is because of publications like the NYU IPR that different fields stay current and also advance; that new ideas are born, and new avenues of study come to light. In addition, like so many other institutions, the NYU IPR only gets better as it continues forward - ideas become enhancements, alterations develop into updates, and inspirations morph into enrichment. So, welcome to the 2nd issues of the NYU IPR. We hope you'll find interesting, engaging and thought-provoking. Enjoy!

Andy Hilford
Associate Director Of Graduate and Undergraduate Studies,
Psychology New York University

Note from the Editors-In-Chief

Dear readers,

We are proud to present the second edition of the New York University Integrative Psychology Review. This edition is the result of months of work from authors, our staff editors and faculty mentors throughout the past year.

We are very grateful and humbled to have the opportunity to publish this review. This edition features nine budding researchers who, during this time, have worked tirelessly to produce the featured empirical research and literature reviews.

With this new edition comes a shift in our editorial staff, namely bestowing the role of Co- Editors-in-Chief onto the following senior members of our editorial team. It has been an honor and a pleasure to work alongside those featured in this review and the staff who assisted in its production.

We hope that NYU IPR continues to inspire undergraduate researchers to pursue their passions for psychological investigation, and we look forward to reading future editions in the years to come.

Sincerely,

Sanjana Dixit
Founder and Co-Editor in Chief

Samantha J. Gordon
Co-Editor in Chief

Lingering on Loss: Experiences of Grief in Response to the Environmental Crisis

Isabel Grant

Department of Global Liberal Studies, New York University

Abstract

While research and policy have hyper focused on the physical health dimensions of the environmental crisis, there remains a critical need to acknowledge the psychological effects of this escalating crisis. This paper establishes that ongoing environmental transformation and destruction are forms of loss that not only impact physical health, but also mental health. These losses are occurring through both salient and abstract events, complicating traditional distinctions between direct and indirect loss experiences. Focusing on Indigenous and non-Indigenous youth narratives, this paper investigates how these groups conceptualize and process different forms of environmental loss and grief.

Chapter1: Introduction

State of the Environment

As the scope and pace of environmental change and destruction continues to escalate, there is a growing need to understand the connections between the state of the environment and human health. While policymakers, health officials, and academics have recognized that climate and environmental change threatens public health, assessments and responses remain inadequate in scope. The 2016 Paris Agreement establishes that signing Parties have an obligation to address environmental change and destruction to protect people's welfare, however, the current global response is critically insufficient to meet international targets. The inability of world leaders to prioritize mitigating environmental degradation and limiting global warming below 1.5° C has created "the greatest threat to global public health" (Atwoli et al., 2021, p. 1136; United Nations, 2016; United Nations Framework Convention on Climate Change, 2021). Ongoing changes in environmental and climatic systems have already impacted every region of the world—with the frequency and intensity of these events increasing. Current science warns that many anticipated consequences due to previous and current greenhouse gas emissions are "irreversible," emphasizing the enduring impact these changes will have on global public health (Intergovernmental Panel on Climate Change, 2021, p.28). Given that the impacts of past and future environmental transformation will continue to shape global public health, the need to assess and address both the physical and mental health dimensions of these crises is urgent.

An Era of Loss and Mental Health Responses

In previous research and policy, there has been a hyper focus on the physical health ramifications of climate and environmental change. It is well documented and discussed that as extreme weather, sea level rise, pollution, and resource insecurity increase, physical morbidity and mortality will be exacerbated (Intergovernmental Panel on Climate Change, 2021; Atwoli et al., 2021; Smith et al., 2014). These progressive environmental changes articulate the unprecedented, collective loss the environment is undergoing. Current conventional framings of environmental loss are primarily concerned with the preservation of economic goods and services

such as land and infrastructure. While public and political discourses remain focused on economic losses, climate and environmental change continue to deprive people of things they value beyond this extent. Non-economic forms of loss—health, culture, knowledge, safety, freedom—are often not acknowledged, hindering the implementation of holistic and meaningful approaches to climate resiliency (Puig et al., 2019, p. 2). In particular, mental health is largely considered a "hidden cost" of climate and environmental change (Lawrance et al., 2021). As the ramifications of the environmental crisis continue to unfold, there is a need to establish a comprehensive "science of loss" to both assess people's experiences of loss and mitigate emotional distress. Ignoring current or anticipated loss not only exacerbates personal suffering but also perpetuates a "collective paralysis" in global climate mitigation and adaptation efforts (Barnett et al. 2016, p. 977). Engaging in a science of loss prioritizes greater intentionality and thoroughness in loss research and responses, which is necessary to instigate meaningful environment policy and support people's mental health.

Recent surveys evaluating the impacts of ongoing environmental and climate change on public health confirm that mental health is being strained. In a series of polls conducted by the American Psychiatric Association (APA) between 2019 and 2020, the percentage of Americans who find that climate change is impacting mental health increased from 47% and 68% as the destabilization of the environment has worsened (2020). In particular, young people are being disportionately affected: 67% of Gen Zers (18-23 years) and 63% of millennials (24-39 years) are worried about the ramifications of climate change on their mental health in contrast to the 42% of Baby Boomers (56-74 years) and 58% of Gen Xers (40-55 years) (American Psychiatric Association, 2019). Other research reiterates that across both direct and indirect experiences of climate and environmental change, young people exhibit greater emotional distress (Aylward et al., 2021). These generational differences inform this paper's focus on young people and their current circumstances.

Direct and indirect experiences of climate and environmental change are typically distinguished by their physical proximity to events. Direct experiences encompass "first-hand" exposures, while indirect experiences include the perception of ongoing climate and environmental change, other people's hardships, and an anticipation of future events (Lawrance et al., 2021, p.11; Aylward et al., 2021). Berry et al. (2018) explain that these experiences are unlikely to prompt new categories of psychiatric disorder, but instead they compound existing mental disorders or cause initial onset (p. 282). The most common field of study that addresses both mental health and the environment is the impact of severe weather events—such as flooding, wildfires, and hurricanes—on emotional wellbeing. In response to these tangible, event-driven losses, there are often acute and documented mental health responses—the immediacy and visibility of these events and their impacts allow them to be more readily addressed. Common experiences include post-traumatic stress disorder (PTSD), depression, anxiety, and grief (Lawrance et al., 2021; Clayton et al., 2017). Mental health is also impacted by chronic, subtle, or indirect experiences of environmental changes, yet the diversity and intangibility of these experiences have historically made them difficult to identify and validate (Lawrance et al., 2021; Nixon, 2011; Clayton et al., 2017; Cunsolo & Ellis, 2018). As with direct experiences of change and loss, depression, anxiety, and grief manifests from these indirect experiences. Therefore, the effects of these different losses are connected as they interact across spatial and temporal scales (Lawrance et al., 2021, p.11).

Research Focus and Preliminary Hypothesis

This paper will explore the psychological dimensions of ongoing climate and environmental change, focusing on experiences of environmental loss and grief amongst Indigenous and non-Indigenous youth in the United States. Young people and Indigenous people are two groups that stand to be the most affected by the environmental crisis, yet research on these demographics remains

limited (Lawrance et al., 2021; Galway et al., 2019; Cunsolo & Ellis, 2018; Middleton et al., 2020; Allen, 2021; U.S. Surgeon General; 2021). This paper establishes that environmental transformation and destruction are forms of loss that not only impact physical health, but also mental health. These losses are occurring through both salient and abstract events, complicating traditional distinctions between direct and indirect loss experiences. Centering the experiences of Indigenous and non-Indigenous youth, this paper investigates how these groups conceptualize and process different forms of environmental loss and grief.

The remainder of Chapter 1 details the conceptual framework utilized throughout the paper. While this chapter outlines key tools of analysis, the proceeding chapters will apply these concepts to case studies and assess the usefulness and limitations of these frameworks in relation to Indigenous and non-Indigenous youth experiences. Chapter 2 explores recent wildfires in Northern California as a case study to evaluate young people's responses to event-driven loss. Chapter 3 transitions away from event-driven loss to more broadly assess these groups' responses to progressive and ambiguous forms of environmental loss in the United States.

To evaluate these different forms of loss, the paper will primarily take a qualitative and narrative based approach, fusing existing research with interviews (New York University IRB approved these interviews. Informed consent was given by all adult subjects). While building climate resiliency on a personal, institutional, and global scale remains the long term goal, this cannot be achieved until there is a more comprehensive understanding of the various loss and grief experiences occurring. Grief response models often begin with "naming and claiming" to identify and validate these behavioral responses (Harris & Winokuer, 2019, p. 131; Weir, 2020). As the concept of ecological grief gains more recognition, psychologists have stressed the need to apply the practice of "naming and claiming" to this form of grief to legitimize these experiences and to support young people that remain particularly susceptible to these emotions (Aylward et al., 2021). Given the large gap in research and policy that recognizes let alone articulates the nuances of these loss and grief experiences, this paper will not offer specific clinical or policy recommendations, but instead focus on explicitly acknowledging and legitimizing environmental loss and grief.

Interview participants meet several criteria: they identify as Indigenous or non-Indigenous young adults (18+) living in the United States, and for research specific to Chapter 2, they reside or have previously resided in California areas impacted by wildfires. The recruitment process took place online through email and social media, primarily through public posts on personal accounts and correspondence with student groups based out of universities. Interview participants were asked a standard set of questions exploring the mental health impacts of environmental change and their conceptualizations of related loss and grief. However, the nature of these questions were open-ended, allowing participants to answer and elaborate freely. In total, 20 interviews were conducted virtually by phone or video call (To protect participants' privacy, direct identifiers such as name, age, and gender have been removed).

Supplementing existing research with these personal narratives aims to generate research that is both collaborative and validating to avoid making reductive arguments that perpetuate the limitations of existing scholarship. Barnett et al. (2016) acknowledge the inevitable paradox of engaging with loss—it initially exacerbates emotional distress, yet active engagement with loss is essential to reducing long term suffering. To mitigate the discomfort induced by engaging with loss and to create inclusive and accurate research, there is value in co-producing knowledge with those impacted by or likely to experience loss (p. 977).

To examine what the mental health impacts of environmental loss are on Indigenous and non-Indigenous youth in the United States, several questions will be explored: do different

experiences of environmental loss—salient or abstract, direct or indirect—elicit different grief responses between and within these groups? Do pre-existing grief and loss frameworks and terminology adequately encapsulate Indigenous and non-Indigenous youth experiences?

Framework and Tools of Analysis

There are several existing grief and loss paradigms that will provide the foundation of the conceptual framework. While in some ways ecological grief is a distinct phenomena, it is understood in relation to other grief and loss concepts that will be outlined below. This section also highlights Indigenous research frameworks and the concept of "two-eyed seeing" to challenge the dominance of the western worldview upheld in literature, establishing a more holistic framework to explore ecological loss and grief.

Limitations of Existing Grief and Bereavement Practices

A historical view of the field of grief and bereavement provides insight as to why ecological loss and grief have been largely unacknowledged in research, policy, and public discourse. While grief has long been recognized as a normal and healthy response to loss, practitioners and researchers have historically defined grief as a response to the death of loved ones—not considering non-human experiences of loss. Compounding this limited definition of grief is the well established view that grief is a linear process and therefore, finite (Hall, 2014). In this way, only loss and grief experiences that adhere to these narrow definitions and timelines have been historically validated. While academics and clinicians have begun to embrace frameworks that incorporate non-human loss and non-linear models of grief, the impact of these long-standing views lingers. Dr. Robert Neimeyer, the director of the Portland Institute for Loss and Transition, notes that the historically limited scope of this field has resulted in psychology programs that give "cursory attention" to grief and loss, producing clinicians without training in this field (Weir, 2020).

Beyond research and clinical settings, there remains a larger, cultural fixation on closure and efficient mourning. There is a lack of cultural practices—at least in western societies—to help people recognize and address loss and grief that is persistent or undefined (Boss & Carnes, 2012, p. 456; Allen, 2021). While preindustrial societies centered around community networks, western lifestyles—particularly in the United States—now favor individualism. Given that grief is no longer a collective experience "ritualized by the community," mourning is expected to be "private and brief." (Institute of Medicine Committee for the Study of Health Consequences of the Stress of Bereavement, 1984, para. 9). The impact of this socio-cultural shift is reflected in the current paid leave practices of U.S. workplaces. On average employees receive 4 days of bereavement leave after the death of a spouse or child, 1-2 days for extended family, and often no time off for a friend or colleague (The Society for Human Resource Management, 2016, p. 21). These constrictive timelines highlight the lack of public allowance for grief and reinforce the notion that mourning should be hidden and quickly dealt with. The environmental crisis further exacerbates the inadequacy of our current grief processes. Allen (2021) notes that the acknowledgment of existing and anticipated loss due to climate and environmental change is a relatively recent phenomena, and so "we don't have cultural practices in place to help us process this type of grief" (para. 13). Environmental loss and grief experiences further complicates and stresses the shortcomings of established research, training, and public discourse. The impact of these socio-cultural and institutional shortcomings on people's ability to perceive and process grief will be further reflected upon in the interview responses.

Living Losses

In order to explore experiences of ecological loss and grief, this paper relies on a more inclusive and comprehensive definition, considering grief as a reaction to "loss in all of its totality, including its

physical, emotional, cognitive, behavioral, and spiritual manifestations" (Hall, 2014, p.7). Relying upon this more complex understanding, ecological loss can be framed as a type of living loss—a loss that is evolving and continually lived by an individual (Harris & Winokuer, 2019, p. 135). Living loss encapsulates loss beyond the death of loved ones, including loss that stems from "life altering events and changes" that may not be "tangible or overt" (p.122). Two forms of living losses will be used to describe and explore youth experiences: nonfinite and ambiguous loss. These types of living losses are referenced in subsequent chapters to frame the nuances of both direct and indirect experiences of environmental loss.

As manifestations of living loss, both nonfinite and ambiguous losses have significant overlaps yet maintain some distinctions. Nonfinite losses are experiences that persist both physically and/or psychologically, usually preceded by a "negative life event" (Harris & Winokuer, 2019, p.135). While nonfinite loss is event driven, these losses may be either concrete or obscure, stemming from "any loss experience" (Schultz & Harris, 2011, p. 238). In comparison, ambiguous losses are physical and psychological losses that do not have a clear origin and as a result, it "may be unclear exactly what has been lost" (Harris & Winokuer, 2019, p.128, Boss (1999) first used the term ambiguous loss, applying the term to family stress models. Originally, this term was used to describe non-death, human losses. In the first scenario, a person is physically absent but psychologically present (missing person, ex-spouse). In the second scenario, a person is physically present but psychologically absent (people with dementia or addiction) (Boss & Carnes, 2012). However, the application of this term has expanded beyond the loss of loved ones to include unclear and enduring, non-human losses). However, there are several commonalities between nonfinite and ambiguous loss: these experiences are both continual and changing, salient and abstruse, physical and psychological, unacknowledged and undervalued (p.130).

In response to these living losses, Boss & Carnes (2012) have identified possible grief presentations, including disenfranchised grief—"grief that is stigmatized and not openly recognized"—and anticipated grief— "grief in response to possible future loss" (p. 461). Given that nonfinite and ambiguous loss are often invalidated or unaddressed because they are not bound to fixed timelines or events, they can be framed as disenfranchised losses that precipitate disenfranchised and anticipated grief (Harris & Winokuer, 2019, p.131).

Ecological Grief

Ecological grief is situated within this living loss paradigm, offering new applications of this framework in the context of ongoing environmental and climate change. Ecological grief is a natural behavioral response defined as the "grief felt in relation to experienced or anticipated ecological losses" (Cunsolo & Ellis, 2018, p. 275). Ecological grief is seen as another form of disenfranchised grief as it is a relevantly new concept that is not reflected in clinical practices or "climate narratives, policy, and research" (Cunsolo & Ellis, 2018, p. 275; Allen, 2021). Additionally, environmental grief that is specifically in response to future loss can be framed as a form of anticipated grief as young people grapple with the ramifications of further environmental destabilization.

The loss events that elicit these grief responses can be subdivided into three categories, highlighting both the distinctions and overlaps between grief experiences across different spatial and temporal scales: "grief associated with physical ecological losses (land, ecosystems and species), grief associated with environmental knowledge and loss of place-based identity, and grief associated with anticipated future ecological losses" (Cunsolo & Ellis, 2018, p. 276) (The term solastalgia, originated by Dr. Glenn Albrecht, has also been used to explain loss experiences that alter place-based identities. Albrecht et al. (2007) define solastalgia as the distressed "caused by the loss or lack of solace and the sense of isolation connected to the present state of one's home" (p. 45). Given that ecological grief remains under

researched, it remains unclear amongst scholarship the connections and distinctions between solastalgia and ecological grief. While this paper acknowledges the link between place-based identities and mental health outcomes, the term solastalgia will not be used). These broad categories account for both acute and progressive, tangible and abstract, and direct and indirect loss experiences. Additionally, the research of Cunsolo & Ellis (2018) with Inuit from Nunatsiavut (Canada) and farmers from the Australian Wheatbelt finds that grief experiences are more intensely experienced by people who have significant ties to the environment—culturally, occupationally, or emotionally. The lived experiences that inform people's connection with the environment and their subsequent perceptions of ecological loss and grief will be explored further in proceeding chapters.

Given that ecological loss and grief remains understudied, Cunsolo & Ellis (2018) note that these proposed groupings cannot fully encompass the many manifestations of ecological loss and grief. However, classifying grief through physical, knowledge, and future loss anchors the research, yet allows room for overlap, interpretation, and expansion. These categories remain useful as they provide a flexible and fundamental framework to help unpack participants' responses.

Slow Violence

A related concept to living losses and ecological grief is slow violence— a term useful for describing the intangible nature of environmental change and for validating loss and grief experiences that are chronic and subtle. Nixon (2011) redefines violence, challenging the notion that violence is immediate and noticeable with instant consequences. Instead slow violence is incremental, hidden, and occurs across various temporal scales (p.2). While some environmental violence is immediate such as wildfires, Nixon highlights that environmental degradation and changes are often forms of slow violence, making it especially difficult to mitigate and adapt to this violence on an individual and institutional scale, Therefore, environmental violence is a "contest not only over space, or bodies, or labor, or resources but also over time" (p.8). The gradual and insidious nature of these violences—deforestation, ocean acidification, warmer winters, and hotter summers—is at odds with our collective and conditioned attention spans. Society validates images and narratives of environmental violence that are "spectacular" and therefore "newsworthy," adhering with our collective expectation and craving of immediacy and spectacle (p. 2-3). In reconceptualizing violence and challenging traditional time restrictions, Nixon highlights that the past of violence is "never past, so too the post is never fully post" (p. 8). This blurring of temporal scales will be important to consider in later chapters as the paper discusses the distinctions and similarities between grief responses to direct and immediate loss and indirect and gradual loss.

Indigenous Research Frameworks

While the concepts of living losses, slow violence, and ecological grief are pillars to this work, these concepts emerge from western science and therefore, they may not encapsulate Indigenous conceptualizations and experiences of grief and loss. Much of existing academic literature only utilizes Indigenous knowledge to bolster western, scientific frameworks—instead of valuing Indigenous perspectives in its own right, this knowledge is merely incorporated into western scholarship (Simpson, 2004; p. 374). However, this tendency often undermines the value of Indigenous expertise and the intentions of Indigenous researchers (Wilson et al., 2020). As Hart (2010) explains, work with Indigenous people should "act outside of the dominant worldview," and therefore independently recognize the merit of Indigenous scholarship (p.2).

In order to consciously employ both western science and Indigenous knowledge, this paper references a "Two-Eyed Seeing" framework. This health research model—created by Mi'kmaw Elders Albert and Murdena Marshall—recognizes the value of both western and Indigenous knowledge in fostering wellbeing. Instead of

trying to incorporate Indigenous views into western science, this approach does not favor one type of research over another, as a variety of understandings is "integral to the promotion and protection of the health of people and Mother Earth," (Martin, 2012; p. 29). The concept of seeing through two eyes relies on the notion that each eye captures an incomplete worldview, while both eyes together create a "new way of seeing" that honors these different perspectives (p.31).

A "Two-Eyed Seeing" framework is inherently a decolonized approach to research that centers Indigenous perspectives on health by being "participatory" and "community-based" (p. 23). This closely relates to the point previously mentioned by Barnett et al. (2016) that knowledge should be co-produced with impacted individuals or communities. In particular, the interview-based component of the paper is influenced by this decolonized, two-eyed seeing approach to research, aiming to not just describe the mental health issues being experienced by Indigenous youth, but allowing participants a level of agency in articulating their experiences of loss and grief.

In order to implement a two-eyed seeing approach that recognizes both western science and Indigenous scholarship, Hart (2010) highlights key tenants of Indigenous knowledge and culture that inform an Indigenous research framework: there are relationships and respect between all life forms that are not only physical but spiritual—guided by "ceremony and ritual" (Hart (2010) framework is established from a previous paradigm created by Wilson (2001), who argues that an Indigenous research framework consists of an ontology, epistemology, methodology, and axiology.); Indigenous knowledge is generated and preserved through storytelling and therefore community Elders are invaluable. While these generalizations will inform this paper's approach to the case studies and interviews, scholarship also stresses that Indigenous research and knowledge cannot be reduced to a broad set of themes. Rather, perspectives and values are specified to local environments—Indigenous politics, spiritual practices, and language are particular to a place or group (Wilson et al. 2020; Simpson, 2004; Martin, 2012). These Indigenous research frameworks inform how this paper will incorporate Indigenous perspectives in Chapters 2 and 3. While exploring grief and loss experiences of Indigenous youth, narratives will be contextualized to the specific 2012). These Indigenous research frameworks inform how this paper will incorporate Indigenous perspectives in Chapters 2 and 3. While exploring grief and loss experiences of Indigenous youth, narratives will be contextualized to the specific socio-cultural backgrounds and values of a given community or individual. Indigenous research participants have complex socio-cultural backgrounds, holding multiple identities and knowledge systems: some have grown up on reservation land or consider themselves Urban Natives, while others have ties to a broader Indigenous network or are reconnecting with their Indigenous roots in adulthood. While this paper will acknowledge broader themes presented throughout the interview responses, it will also emphasize the individuality of these perspectives and the unique factors that inform participants' responses to avoid perpetuating a monolithic narrative.

Chapter Two: California Wildfires Case Study

Key Consideration of Wildfires

To assess the emotional responses to physical experiences of climate and environmental change, this section uses wildfire events in California as a case study. Although the occurrence of weather-related disasters has increased fivefold between 1970-2019 due to climate change, the number of associated deaths has decreased roughly threefold globally (Stone (2021) highlights that worsening climate change could reverse this low disaster mortality rate if the scale and pace of destruction eclipses existing solutions and infrastructure). The severe weather events that have resulted in the greatest human deaths during this 50 year period include droughts, floods, storms, and extreme temperatures—notably, not wildfires (World

Meteorological Organization, 2021). These global, historical trends are also reflected in the relationship between disaster events and mortality rates in the United States. Since 1970, wildfires have accounted for only 0.4% of total disaster related deaths (Borden & Cutter, 2008, p.5). While wildfires have seismic impacts on both the environment and people, they result in less deaths relative to other environmental disasters. Their lower mortality rates make wildfires practical events to explore non-human experiences of loss and grief—experiences under acknowledged in research and public discourse.

Globally, the intensity and frequency of wildfires are compounded under ongoing environmental and climate change. In particular, as global warming increases "with every increment," the scale and devastation of wildfires are expected to escalate significantly (Intergovernmental Panel on Climate Change, 2022, p. 20). The growing magnitude of wildfires due to human-induced environmental and climate change is readily apparent across the world with recent fires events spanning from the Western United States to Brazil, Australia, the Arctic, Siberia, and Indonesia (Penney, 2020).

Assessing the drivers of California's particular wildfire activity requires an acknowledgement of both climatic and non-climatic factors. The western portion of the United States is historically susceptible to wildfires due to the dry climate; large fires events in the state have occurred historically dating back to 1860, however, the intensity and frequency of these fires have been increasing over the last few decades (Keeley & Syphard, 2021). Between 1972–2018, Williams et al. (2019) found that annual burned areas in California increased fivefold by 405% (p. 896). Eight of the top ten biggest fires have occurred in the last decade, while seven of the top ten most destructive wildfires occurred since 2015 (California Department of Forestry and Fire Protection, 2022). Several non-climatic factors have contributed to this escalation in fire events, including fire suppression practices, vegetation cover, and settlement trends. Population growth alone has extended cities and urban sprawl into rural areas, altering the landscape and increasing the occurrence of human-ignited wildfires (Keeley & Syphard, 2021, p. 9; Williams et al., 2019, p. 893). In addition, federal practices over the last two centuries have revolved around fire suppression, contributing to a build up of "small trees, grass, brush, and leaves" (Iannone Román, 2020, para. 6). Paradoxically, the stringent prevention of all fire activity has produced a reserve of fuels that renders the state more vulnerable to wildfires (Iannone Román, 2020; Pierre-Louis & Schwartz, 2020; Williams et al., 2019, p. 900).

These established fire suppression tactics disregard Indigenous practices and knowledge. In 1850, California passed a law criminalizing cultural burning practices—the deliberate use of fire by Indigenous people that support both ceremonial practices and biodiversity. Since the 19th century, this law has been strictly enforced and Native people were killed for burning practices until the 1930s (Iannone Román, 2020; National Public Radio, 2021). While state and federal institutions equate fire with destruction, Indigenous communities understand fire to be "sacred." Bill Tripp, the director of natural resources and environmental policy at the Karuk Tribe Department of Natural Resources, explains that fires fortify planetary systems: cooling bodies of water, regulating brush, and making foods more nutritious and adaptable to support all life forms. Therefore, current wildfires not only reflect a physical, ecological loss, but also a loss of environmental knowledge and "Indigenous stewardship" (Tripp, 2020, para.3,8). While California has introduced new legislation in 2021 that would incorporate cultural burnings into fire mitigation plans, this loss of knowledge and culture is enduring. Don Hankins, a Plains Miwok fire expert and professor at California State University, estimates that there are only a "few dozen people" that retain Indigenous knowledge of burning. Efforts to reclaim what has been lost and expand the practice of cultural burnings within Native communities and the

larger public remains ongoing (National Public Radio, 2021, para.8,10).

While these non-climatic factors have contributed to changes in wildfire conditions over the course of centuries, Williams et al. (2019) assert that climate change is overwhelmingly responsible for the recent uptick in wildfire activity (p. 900). In particular, anthropogenic climate change has heightened atmospheric aridity which dries fuels and ignites fires specifically throughout the Coast and Sierra Nevada regions of the state. Given that a modest increase in atmospheric aridity has already caused a fivefold increase in the annual areas burned in California, it is likely that the intensity of wildfire activity will be further exacerbated as climate change continues (p. 905).

As the scope of wildfires has grown, the number of people physically impacted or vulnerable to these events has doubled over the last two decades. An analysis of census tracts highlights that on average people residing in rural areas are more impacted by wildfires given the proliferation of vegetation, fuels, and a lack of firefighting resources. These geographical regions also tend to have higher rates of poverty and unemployment, highlighting the disproportionate vulnerability low-income communities experience. While areas with greater fire occurrence tend to have lower minority group populations, Native Americans remain a distinct outlier and often live in areas impacted by wildfires (Masri et al., 2021, p.13). While White residents tend to live in regions with greater Wildfire Hazard Potential (WHP), this demographic retains a stronger "adaptive capacity"—making them less vulnerable to fire events on average—compared to other racial and ethnic groups inhabiting the same areas (Davies et al., 2018, p.11) (Davies et al. (2018) define WHP as a metric that assessments fuels, vegetation, weather, and historical fire events to determine the likelihood that a given area will be impacted by extreme fire events). In contrast, Native Americans tend to live in areas with greater WHP in conjunction with "lower adaptive capacity," making them especially susceptible to wildfires. A significant factor contributing to this vulnerability is the historically imposed resettlement of Indigenous folks onto federal reservations that are often in rural areas that are socially, economically, and environmentally disadvantaged. Therefore, Indigenous individuals living on reservations, especially in the western United States, are even more likely to be impacted by extreme wildfires than individuals residing outside of reservation lands (p. 8-9). Farrell et al. (2021) reiterate similar findings, estimating that tribal lands have shrunk by 98.9% over time; these forced conditions have lessened the economic viability of modern tribal lands and increased people's vulnerability to climate change and events—particularly wildfires.

Beyond the physical risks wildfires provoke, exposure to these events can significantly impact mental health in both the short and long term. The most common mental health responses to natural disaster events include post-traumatic stress disorder (PTSD), depression, and generalized anxiety. In a 2021 scope review of 254 studies, To et al. (2021) note that existing literature establishes an increased rate of these conditions—for both children and adults—immediately after wildfires and years later (p.1). These larger trends are consistent with documented mental health outcomes of California residents in response to the 2018 Camp Fire. Silveira et al. (2021) find that the level of fire exposure as well as pre-existing factors such as age and socioeconomic status influence the severity of mental health outcomes. Individuals directly exposed to the 2018 Camp Fire event ("to whom the fire happened") were more likely than people indirectly exposed ("who witnessed the fire") to be behaviorally impacted (p.10). These findings highlight that within event-driven loss experiences, the degree of exposure to fire events elicits different mental health responses, complicating simplistic definitions of direct experiences of loss. In this way, direct experience does not equate to a fixed proximity to loss events. In addition to degree of exposure, younger age was linked to more significant symptoms of Major Depression Disorder, General Anxiety Disorder, and PTSD (pp.8-10). The confluence of these

factors—age and exposure extent—outlined by previous research will be further explored in the excerpts of young people's wildfire experiences later in the chapter.

While previous work has established a causal relationship between wildfires and adverse mental health impacts, the scope of existing research remains insufficient in several ways. Silveira et al. (2021) acknowledge that existing assessments of mental health and wildfires may be inadequate as these events are often framed as natural disasters and singular events, diminishing the influence of climate change and its distinct vulnerability factors on behavioral outcomes (p.2). To et al. (2021) also highlight that the existing focus on PTSD, depression, and anxiety may no longer fully encapsulate people's behavioral responses to wildfires as an appreciation of terms such as ecological grief and eco-anxiety grows (p.1). An additional limitation on mental health and wildfire frameworks is the lack of focus on youth populations. While increased psychological distress is observed amongst young people after wildfires in Australia and Canada, "little research" focuses specifically on the youth mental health impacts of wildfires in the United States (Sugg et al., 2022, p.2). Existing scholarship investigates a limited number of behavioral outcomes and populations, underscoring the need to investigate mental health responses specific to climate and environmental change—such as ecological grief and eco-anxiety—amongst young people.

Response to Event-Driven Loss

Linking Wildfires and Loss

To assess the psychological impacts of event-driven loss, this chapter considers the perspectives of young adults who have lived through wildfire events in California. All research participants express a degree of impact from recurring fires throughout the state, however, their degree of connection to these events—both physically and emotionally—varies, influencing their perceptions of loss and grief. To explore participants' responses within a living loss framework, subjects were asked if they perceived these wildfires as forms of loss. A common theme amongst the responses is a distinct loss of stability and agency. As a subject explains, wildfires inflict an overall "loss of ability to participate in normal life." For several participants from the Bay Area, their high school experience was altered by severe wildfires. One interviewee describes this portion of high school as "dystopian"—the skies were often red, windows couldn't be open because of ash and air quality concerns, masks had to be worn indoors predating COVID-19, and extracurricular activities were repeatedly canceled:

> "I think a lot of people my age felt this kind of insurmountable loss because you weren't given a chance to literally be a kid and go outside and play because the outside is destroyed".

In this way, this physical proximity to wildfires destabilized their ability to attend school and have regular teenage experiences. Compounding the loss caused by the wildfires was the emergence of another loss event, COVID-19. This participant elaborates that "combining the fires and COVID amounted to a loss of your teenage years." The interplay between these event-driven losses further undermined their sense of freedom and normalcy. Another participant, who endured a similar school environment, explains that the confluence of these factors—air quality, the pandemic, isolation—severely exacerbated their pre-existing health issues:

> "I suffer from depression and anxiety and I've also had chronic migraines for my whole life. And when the fires got really bad, we couldn't go outside [and] from the smoke I started getting horrible migraines and missing school. I just started getting really stressed and right around that time—at peak of fire season—was when I ended up attempting suicide and was hospitalized for a bit. I definitely think that

> the fires impacted my physical health which impacted my mental health".

For this participant, the acuity of these events aggravated their pre-existing health conditions, which subsequently compromised their ability to attend school and engage in regular teenage experiences.

While these participants' close proximity to wildfires event did not result in any material losses, other subjects endured this form of loss. One interviewee, living on the border of California and Oregon, describes the impact of their trailer home catching on fire:

> "It was so damaged that we could not live there anymore. I was homeless... I still slept on my smoke damaged mattress because mattresses are expensive and that for sure affected my physical health".

While this participant experienced a loss of physical and monetary safety, they express that one of the "greater losses" was the "loss of a sense of community." With the trailer park devastated by the fire, the community dissolved as individuals relocated where they could. The various types of losses inflicted by this experience, highlight the inherent interplay between economic and non-economic loss. This challenges the typical distinctions and priorities made by policy makers when assessing environmental loss—previously articulated by Puig et al. (2019). As this participant's experience demonstrates, valuing one form of loss over another ignores their inherent connection.

Other research subjects primarily perceive wildfires as losses of ecosystems and environmental knowledge. A California resident with Indigenous roots in Western Guanajuato articulates the relationship between ongoing wildfires events and the suppression of Indigenous practices:

> "Wildfires are a loss that stem from colonialism. Colonization has taken so much from Indigenous people including the right to culturally burn or prescribe burnings in California, which has so many benefits to the ecosystem. As stewards of the land, we understand our relationship to the land. Western society sees land as an extractive resource that they have the right to" .

(Participant uses the collective framing "we" to refer to the Indigenous communities broadly)

Through this understanding, the loss inflicted by wildfires is an indicator of larger losses under colonialism. The prevention of cultural or prescribed burnings highlights the suppression of Indigenous understandings of the land in favor of Western priorities. Another California resident and member of the Shinnecock Nation further emphasizes that Indigenous people have "known for such a long time that fire is a really important part of the ecosystem," and by ignoring Indigenous insights, there is an "overwhelming" loss of plant and animal life: "humans are pretty resilient and can fix things, but an entire forest can't regrow overnight in the way that people can rebuild houses." Therefore, wildfires are not only a loss of species, but also a loss of knowledge.

Enduring and Anticipated Loss

Due to the cyclical nature of wildfire events—superimposed on an escalating environmental crisis—many participants describe their loss experiences as enduring and anticipatory. Interviewees express that their loss experiences are not just connected to wildfire events but other enduring losses, contextualizing event-driven loss within a larger era of loss. One participant explains that loss is inescapable given the multitudes of loss concurring:

> "I think that we have become so akin to how often tragedy happens. We aren't—as victims of tragedy—able to experience them fully because it happens too often... I'm thinking of climate change but also

thinking of mass shootings. Unfortunately, those two things are kind of equitable in the way that we participate in this society".

This response indicates that loss cannot be contained to a singular type or event as various losses compound one another. Elaborating further, this participant explains that the pervasiveness of loss is indicative of anticipated, future loss and instability:

> "It's really strange to not have security. We don't really know what our lifetime is going to look like and how long our lifetimes are. It's so it's uncertain—we just don't know how bad it is going to get".

Another participant reiterates a similar experience and concern, emphasizing that this generation of young people are uniquely inundated with continual losses:

> "We don't have the stability of other generations. If you take into account school shootings, living in California with wildfires, and COVID, and all the group trauma that simply our age has experienced".

Building off their previous point linking wildfires to colonization, an interviewee explains that as long as colonization persists, loss—beyond wildfire events—will too:

> "My sense of loss is enduring. As I mentioned before, this phenomenon persists because colonialism is still seeping into our time. I feel that loss will be enduring until we get to a place where colonialism and its effects are rooted out".

For many participants, wildfires are one of the many losses they are contending with. As loss experiences compound one another, distinctions between direct and indirect losses soften.

Absence of Loss

While many participants relay an experience of loss in responses to wildfire events, a minority of people do not express this sentiment. One participant explains that although they have grown up in a canyon where wildfires are so "prevalent" that they regularly have to evacuate their home, they do not associate these experiences with loss or grief:

> "I don't feel extremely personally affected by [the wildfires]...I don't want to claim victimhood because I haven't really lost anything myself. Wildfires are something to grieve... but I have not thought of it in terms of grief".

Through this framing, loss is commodified. The lack of tangible, personal possessions lost inhibits them from perceiving the wildfires as loss and therefore, they also do not experience grief. However, they acknowledge that wildfires "are something to grieve" by those that have been impacted, again commodifying grief as a response to a physical loss. For another participant who has also grown up with wildfires regularly occurring, the normalcy of the events detaches them from the loss:

> "[wildfires] have always just kind of been around...because I haven't lost my home and because no one close to me has lost their home or personal belongings, I don't feel like I have experienced loss. I continue to be desensitized to [the loss] because I just grew up with it. ... There are so many huge things like COVID and gun violence, where we just accept huge losses and we accept huge tragedies as everyday l life".

Like the other participant, loss is commodified in this perspective. Since they have not lost a "personal belonging" and neither have the people in their immediate life, they do not have

a perception of loss. The subject also expresses a desensitization to wildfires and other tragedies. Unlike other participants who articulate a heightened sense of loss due to interconnections between loss events, the magnitude and recurrence of these tragedies has "desensitized" this interviewee to the point that they no longer recognize these events as losses.

For another participant, wildfires cannot be simply framed in terms of loss. As an Indigenous person with ties to the Southern Sierra Miwok and the Nez Perce Tribes, they view wildfires as losses as well as "tools" that have the capacity to sustain life. When asked if they perceive wildfires as forms of loss, they struggle with the rigidity of the question's framing:

> "I'm not really sure...I guess I don't really have a feeling about [wildfires] too much as a loss or a regeneration tool, because it is both. I don't see fire itself as necessarily destructive or bad or damaging on its own".

This perspective reiterates the point made by Tripp (2020) that fire is "sacred," serving many ecological and ceremonial purposes beyond the limited conceptualizations of mainstream, western society. Informed by an Indigenous understanding of fire, this participant embraces the duality of wildfire events as both losses and gains.

Disenfranchised Grief

Participants were also asked if they categorize their emotional responses to these losses as grief. While many participants could contextualize their loss experience through grief, the concept remains largely unexplored by participants personally and unprompted in public discourse.

When prompted, several interviewees related to the term grief, but had not previously linked their loss experience to grief. As one participant describes, "that's a good way of putting it. I hadn't thought of it as such." Another participant reiterates a similar realization:

> "I never actually articulated that it felt like grief, but as soon as you said that and I actually did think about it, I think that's probably the closest word that I would use to describe my loss".

For others, they have previously associated their loss with grief, but continue to process what this means to them. One participant acknowledges that they feel grief in response to their direct exposure to wildfires. However, the lack of public discussions and resources around grief has left them unsure of how to address this behavioral response: "I'm not sure if I've ever been taught how to deal with it personally." For another participant, they learned of the term ecological grief recently and continue to explore its implications:

> "I found that term and I was just like holy crap, I think that's what I've been really feeling for the past year, and I'm still trying to figure out what that means to me".

In conjunction with a lack of awareness of the concept of ecological grief, many participants stress that their mental health experiences have not been validated beyond their personal circles. One participant describes that their previous mental health struggles were exacerbated when they lost their home during a wildfire, but they received little support outside of close friends: "I talked with one person once, and never got any help for it." Other interviewees express a similar disconnect between interpersonal and institutional responses to loss and grief. As one person explains, public interests continue to exclusively frame environmental loss around economic interests, ignoring its consequences on people:

> "I don't think a lot of the major discussions are being had about mental or spiritual health. They are instead about extracting

resources or about politics".

Another participant reiterates that their loss and grief experiences are "validated by other people that went through [wildfires], yet on a "macro level" the loss has not been recognized "at all." Additionally, an interviewee adds that despite a palpable "sense of urgency that we need to be doing something" to address these losses, the "level of action is not matching the urgency at all."

Chapter 3: Broader United States Case Study

Expanding the Scope of Loss

While environmental disasters or climate-induced events provoke psychological distress due to the perceptible loss that follows, indirect experiences also inflict significant mental harm. These indirect experiences arise from a perception of ongoing climate and environmental change and an anticipation of future events. Like direct experiences of loss and change, indirect exposures also invoke grief, loss, stress, and anxiety, with young people remaining particularly vulnerable to these health outcomes (Lawrance et al., 2021; Aylward et al., 2021). Clayton et al. (2017) note that while these indirect effects are not always salient, they still cause as much "damage as acute climate impacts," highlighting the overlap and validity of both event-driven and non-event driven loss (p.27).

While there may be a distance from the physical impacts of climate and environmental change, an individuals' discerned emotional distance from these losses shape their emotional responses. Chu & Yang (2019) establish that as psychological distance to climate change decreases, stronger feelings of fear, anger, and sadness are provoked (p.761). Albrecht et al. (2007) further explain that this perceptual narrowing, aided by globalization and media, "blur" conventional notions of "direct experience" (p.46). Through these global networks, people witness the transformation and destruction of the environment in real time, minimizing people's separation from these event-driven losses. This further complicates definitions of direct experiences, as people viscerally connect and respond to events unfolding elsewhere.

In particular, Indigenous people are susceptible to climate change, threatening to exacerbate existing mental health issues and experiences of ecological grief and anxiety. While the previous chapter outlines the increased physical risks to climate change events Indigenous communities face due to imposed land reduction and resettlement, "neither chronic or acute climatic stressors needed to be experienced directly to induce mental health impacts" (Middleton et al., 2020, p.7). Although this population is disportionately affected, "little is known about the ways in which Indigenous Peoples globally experience climate-sensitive mental health" (p.1). In a scope review of existing literature on Indigenous mental health across major, electronic databases, no articles include an "active monitoring" of mental health outcomes amongst this population (p.7). The lack of research investigating youth and Indigenous indirect experiences of loss and change—despite their disproportionate physical and mental health vulnerability—emphasizes the relevance of amplifying these perspectives in the following section.

Responses to Non-Event Driven Loss:

Looming Loss

In contrast to the previous chapter's focus on the psychological impacts of event-driven loss, this section centers around broader experiences of climate and environmental change amongst young adults in the United States. All research participants express a degree of separation from climate change induced events, acknowledging the largely "indirect impact" these occurances have had on them so far, with several people noting the "privilege" this distance affords them. Despite a physical removal from these ongoing events, climate and environmental change noticeably impacts their emotional wellbeing. Many participants emphasize climate change's looming nature, describing it as a "weight," or a persistent

presence "[sitting] in the back of my mind." This awareness of climate change evokes a variety of emotions amongst participants, including anxiety, frustration, helplessness, hopelessness, fear, and grief.

The interview structure for participants in this case study followed a similar format to the previous case study. To contextualize their experiences within a living loss framework, participants were asked if they perceive climate and environmental change as forms of loss. In comparison to Chapter 2 responses, these participants' perspectives are more future oriented. Many participants connect ongoing climate and environmental change to a loss of future stability and agency:

> "It's a loss of a sense of freedom... in my childhood, there were sort of more infinite possibilities and resources that don't feel true anymore. Of course it was never really true, but it's a change in perspective".

Others reiterate a perceived loss of possibilities as the state of the environment deteriorates further. One subject describes that experiences they expected to have in their lifetime "are now lost," while another expresses that climate change is a loss that "is impossible to take back" and therefore its impact on their life "feels permanent."

This loss of agency and security due to the unfolding environmental crisis also has implications on the vitality of future generations. The expected loss of innocence, potential, and security makes many young adults question if they will have children. For one participant, the "loss of environment" influences their choice not to have kids as they "feel [that] the world is getting more chaotic." From their perspective, the choice not to reproduce is a loss of a "lifestyle" and "what you could have done." A different interviewee explains that they still want to have kids, but realize that their children's quality of life is uncertain:

> "I will probably be the last generation to have a normal way of living that isn't impacted so badly by climate change and it just makes me anxious to look further out into the future and just realize that my children are going to suffer a lot from that".

Offering another perspective, a participant explains that "the weight" of being an Indigenous person further complicates their outlook on having children as climate and environmental change continues to escalate:

> "As a Native person, it's my duty to have Native children... my people have survived a genocide, so I feel like it's the least I can do is to ensure the continuation of my tribe and of my community, and to make sure that you know our knowledge and our traditions continue to get passed down, but at the same time, what is my responsibility to my individual child"?

In this way, the instability of future generations is both a personal and communal loss, impacting bodily agency and community resiliency. Another interviewee expands on the relationship between loss and community:

> "Through mentors there's a lot of talk of the seven generations—of making decisions as they impact seven future generations. It just kind of feels impossible to think in that way because we don't have seven generations to figure things out—it feels like there are generations that are being lost or are already lost. ... it's really like the loss of the future for the community... I mean community in all senses of the word—generations past, present, and future are all part of the same community".

This perspective highlights that the consequences of the environmental crisis are inherently intergenerational. Current loss impacts not only the present generation, but people of the past and the future that embody a community.

Persistent Loss

In further discussions of loss, participants were asked if they perceive their loss experiences as finite or enduring. The majority of interviews acknowledge the enduring nature of their loss experience given that climate and environmental change will continue throughout their lifetime. One participant expresses that as the environmental crisis progresses without an adequate institutional response, the permanence of the loss becomes more perceptible:

> "In earlier stages it felt finite because it just felt like if we could get to the tipping point of enough people caring that changes would be made. And sadly the last few years have kind of discouraged me in terms of what the people in power are willing to do... it feels a little more enduring, like we've kind of passed the point of no return"

Another participant echoes the belief that we no longer have the ability to separate ourselves from these losses:

> "I feel like I will feel this [loss] forever and it'll only get worse. That's kind of the worst part about it... That you don't really feel like an end in sight—it's a continual loss—it's happening every day".

Given the nonlinear and abstract nature of these loss experiences, they can be framed as ambiguous, relating back to a living loss framework. A research subject assesses that "we don't know exactly how much and when we're going to lose, but that it's going to keep happening." These losses are unpredictable as they are not linked to a particular event, remaining unbound to fixed spatial and temporal scales.

However, one participant does not perceive their loss experiences as enduring and ambiguous, but instead tied to witnessing events:

> "[The loss] is contained to when I actually see things happening rather than constantly feeling or thinking about...when I see climate catastrophes there is the moment where I realize, 'oh, this is closer than I thought'... but I'm not the one primarily impacted by the catastrophes that other communities are enduring".

For them, witnessing these events evoke an emotional response and a perception of loss, however, their physical distance limits the long term impact of the loss. While there are many commonalities amongst loss experiences in this section, this divergent experience highlights that loss experiences remain nuanced and require further research.

Another participant complicates dominant conceptualizations of environmental loss further, emphasizing that climate and environmental change produces both loss and gains. On one hand, the participant stresses that Black, Indigenous, People of Color are "the ones that are often the most impacted by climate disasters"—a point previously articulated in the research of Farrell et al. (2021). However, often these mainstream narratives and scholarship "fail to complicate matters." Instead this subject recognizes that climate change produces both losses and gains, "understanding that those both exist at the same time." The participant further explains the duality of these occurrences:

> "During our allotment, the Osage Nation's treaty was such that we kept mineral rights to the land... so we got money from oil being drilled. I do know that for my grandmother towards the end... this money is what was keeping her alive".

In this way, climate and environmental change serve many functions. While fossil fuel extraction harms planetary and human health, it also provides critical monetary support to communities. This reiterates a similar point made in Chapter 2 that environmental transformation brings about both loss and gain.

Connecting Loss and Grief

After establishing a link—albeit complicated—between environmental change and loss, participants were asked if they categorize their emotional responses to these losses as grief. The majority of these loss experiences focus on the loss of future agency, certainty, and community, prompting an anticipatory grief response. As one participant explains, they feel a general grief over the "loss of future" and "what could have been." For another participant, the anticipation of future hardships and environmental destruction causes them to grieve the innocence of their past self:

> "I've learned too much about how much we've lost already and how much we're going to continue to lose. And I can't really go back to that hopefulness. I feel like I grieve for that past me and what could have been"

Another interviewer mourns not only the personal "things that I haven't experienced and that I will lose out," but also grieves for people that will have to "uproot their entire lives" and may not "have the ability to survive." They particularly consider the difficulties Indigenous folks will face with growing instability:

> "As an Indigenous person, I understand the importance of a connection to physical land to your home, to a place that you know you can trace your history... when folks are like, 'oh, I'm going to pack up and move to Canada or the UK'... I can't do that. I mean, I physically can but emotionally, I can't leave the continental U.S. because this is where my people are from".

This excerpt depicts an anticipated grief on both a personal and communal scale. It is not just a grief over the loss of a personal lifestyle, but also the potential compromise of Indigenous ways of living and connecting to land.

While many participants are experiencing grief in response to climate and environmental change, others do not contextualize their loss experiences in this way. Similar to some of the responses in Chapter 2, a few participants connect their loss experiences to grief only after being explicitly asked—unprompted they do not actively perceive these losses as grief. One participant explains that since they have physical distance from the "frontline of these [environmental] crises," grief is not something they are "constantly thinking about." For other subjects, they maintain that they do not experience grief at all. An interviewee recognizes that they are living through loss, but contends that their emotional response is "not exactly grief." Another participant remains unsure if this concept best describes their emotional state:

> "I've heard the term climate grief but I am not sure if I compare it to the grief of the loss of a loved one. I'm not sure if I've felt it in that way, but part of me wonders if I will experience it".

This highlights the enduring practice of using human death as a metric of grief as well as a lack of public awareness around grief in its many forms.

Conclusion

Key Findings

To explore the mental health impacts of the environmental crisis on Indigenous and non-Indigenous youth, this paper looks at the impacts of both event-driven loss and non-event loss on grief and loss perceptions. Across both case studies, most participants express a sense of loss—particularly a loss of agency and stability—indicating the strong emotional impact of all loss experiences. This highlights and validates the ongoing psychological impact the environmental crisis has on young people, while stressing the need to continue to center these voices. However, across both case studies, some participants state that they are not experiencing loss or grief—

regardless of their physical proximity to an event. This suggests that experiences of environmental change and loss are not rigid—not adhering to simple categories of direct or indirect loss experiences. Rather loss experiences—beyond just those inflicted by climate and environmental change—are interacting across a spectrum. In addition, the findings of this work further legitimize a narrative based approach to research on mental health. Through narrative, people gain agency and validation of their experiences that have been historically undervalued.

Limitations and Further Work:

There are several limitations that inform the findings of the paper and future research. Given the restricted scope of the paper, the interview sample size is small and therefore, not fully representative of possible experiences of climate and environmental change. This work only begins to challenge the historical limitations of existing scholarship by taking a narrative approach centered on the experiences of young people. However, much more elaborate research is needed on these understudied groups to adequately validate and address their mental health experiences—and to avoid creating a monolithic narrative.

Given that research connecting the environmental crisis and mental health is quickly emerging and evolving, some of the terms and frameworks utilized throughout require further investigation. Many of these terms and frameworks were created for different purposes or are newly established and not fully realized. As research evolves in this field, other frameworks and terminology may be better suited.

The variety of responses and relationships to grief exhibited by participants suggest that there is an absence of a larger, socio-cultural understanding of grief and its many manifestations—a point also articulated in previous scholarship. These interview findings, coupled with existing research, stress the need for greater acknowledgement of loss and grief in research, policy, and public dialogues.

References

Albrecht, G., Sartore, G.-M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., Stain, H., Tonna, A., & Pollard, G. (2007). Solastalgia: The Distress Caused by Environmental Change. *Australasian Psychiatry*, *15*(Suppl 1), S95–S98. https://doi.org/10.1080/10398560701701288

Allen, S. (2021). *Is climate grief something new?* American Psychology Association. https://www.apa.org/members/content/climate-grief

American Psychiatric Association. (2019). *APA Public Opinion Poll – Annual Meeting 2019*. American Psychiatric Association; American Psychiatric Association. https://www.psychiatry.org/newsroom/apa-public-opinion-poll-annual-meeting-2019

American Psychiatric Association. (2020). *APA Public Opinion Poll – Annual Meeting 2020*. American Psychiatric Association; American Psychiatric Association. https://www.psychiatry.org/newsroom/apa-public-opinion-poll-2020

Atwoli, L., Baqui, A. H., Benfield, T., Bosurgi, R., Godlee, F., Hancocks, S., Horton, R., Laybourn-Langton, L., Monteiro, C. A., Norman, I., Patrick, K., Praities, N., Olde Rikkert, M. G. M., Rubin, E. J., Sahni, P., Smith, R., Talley, N., Turale, S., & Vázquez, D. (2021). Call for Emergency Action to Limit Global Temperature Increases, Restore Biodiversity, and Protect Health. *New England Journal of Medicine*, 1134–1137. https://doi.org/10.1056/nejme2113200

Aylward, B., Cooper, M., & Cunsolo, A. (2021). Generation Climate Change: Growing Up With Ecological Grief and Anxiety. *Psychiatric News*, *56*(6). https://doi.org/10.1176/appi.pn.2021.6.20

Barnett, J., Tschakert, P., Head, L., & Adger, W. N. (2016). A science of loss. *Nature Climate Change*, *6*(11), 976–978. https://doi.org/10.1038/nclimate3140

Berry, H. L., Waite, T. D., Dear, K. B. G., Capon, A. G., & Murray, V. (2018). The case for systems thinking about climate change and mental health. *Nature Climate Change*, *8*(4), 282–290. https://doi.org/10.1038/s41558-018-0102-4

Borden, K. A., & Cutter, S. L. (2008). Spatial patterns of natural hazards mortality in the United States. *International Journal of Health Geographics*, *7*(1), 64. https://doi.org/10.1186/1476-072x-7-64

Boss, P. (1999). *Ambiguous loss : learning to live with unresolved grief*. Harvard University Press.

Boss, P., & Carnes, D. (2012). The Myth of Closure. *Family Process*, *51*(4), 456–469. https://doi.org/10.1111/famp.12005

Bruce, E. J., & Schultz, C. L. (2001). *Nonfinite loss and grief : a psychoeducational approach*. Paul H. Brookes Pub.

California Department of Forestry and Fire Protection. (2022). *Top 20 Largest California Wildfires*. https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf

Chu, H., & Yang, J. Z. (2019). Emotion and the Psychological Distance of Climate Change. *Science Communication*, *41*(6), 761–789. https://doi.org/10.1177/1075547019889637

Clayton, S., Manning, C. M., Krygsman, K., & Speiser, M. (2017). *Mental Health and Our Changing Climate: Impacts, Implications, and Guidance*. Washington, D.C.: American Psychological Association, and ecoAmerica

Cunsolo, A., & Ellis, N. R. (2018). Ecological grief as a mental health response to climate change-related loss. *Nature Climate Change*, *8*(4), 275–281. https://doi.org/10.1038/s41558-018-0092-2

Davies, I. P., Haugo, R. D., Robertson, J. C., & Levin, P. S. (2018). The unequal vulnerability of communities of color to wildfire. *PLOS ONE*, *13*(11), e0205825. https://doi.org/10.1371/journal.pone.0205825

Doka, K. J. (1998). *Disenfranchised grief : recognizing and treating hidden sorrow*. Lexington Books.

Farrell, J., Burow, P. B., McConnell, K., Bayham, J., Whyte, K., & Koss, G. (2021). Effects of land dispossession and forced migration on Indigenous peoples in North America. *Science*, *374*(6567). https://doi.org/10.1126/science.abe4943

Galway, L. P., Beery, T., Jones-Casey, K., & Tasala, K. (2019). Mapping the Solastalgia Literature: A Scoping Review Study. *International Journal of Environmental Research and Public Health*, *16*(15), 2662. https://doi.org/10.3390/ijerph16152662

Hall, C. (2014). Bereavement theory: recent developments in our understanding of grief and bereavement. *Bereavement Care*, *33*(1), 7–12. https://doi.org/10.1080/02682621.2014.902610

Harris D.L & Winokuer, H.R. (2019). Living losses: Nonfinite loss, ambiguous loss, and chronic Sorrow. In *Principles and Practice of Grief Counseling* (3rd, pp. 121-137). New York, New York: Springer Publishing Company.

Hart, M. A. (2010). Indigenous Worldviews, Knowledge, and Research: The Development of an Indigenous Research Paradigm. *Journal of Indigenous Voices in Social Work*, *1*(1). http://hdl.handle.net/10125/15117

Iannone Román, A. (2020). *West Coast Fires Disproportionately Affect Indigenous Communities*. Cultural Survival. https://www.culturalsurvival.org/news/west-coast-fires-disproportionately-affect-indigenous-communities

Institute of Medicine Committee for the Study of Health Consequences of the Stress of Bereavement. (1984). Sociocultural Influences. In *Bereavement: Reactions, Consequences, and Care*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK217844

Intergovernmental Panel on Climate Change. (2021). Summary for Policymakers. *In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

Intergovernmental Panel on Climate Change. (2022). *IPCC Sixth Assessment Report: Summary for Policy Makers*. Intergovernmental Panel on Climate Change. https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_SummaryForPolicymakers.pdf

Keeley, J. E., & Syphard, A. D. (2021). Large California wildfires: 2020 fires in historical context. *Fire Ecology*, *17*(1). https://doi.org/10.1186/s42408-021-00110-7

Lawrance, E., Thompson, R., Fontana, G., & Jennings, N. (2021). *The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice*. Imperial College London. https://spiral.imperial.ac.uk/bitstream/10044/1/88568/7/The%20impact%20of%20climate%20change%20on%20mental%20health%20and%20emotional%20wellbeing%20-%20current%20evidence%20and%20implications%20for%20policy%20and%20practice%20%281%29.pdf

Martin, D. H. (2012). Two-Eyed Seeing: A Framework for Understanding Indigenous and Non-Indigenous Approaches to Indigenous Health Research. *Canadian Journal of Nursing Research*, *44*(2), 20–42.

Masri, S., Scaduto, E., Jin, Y., & Wu, J. (2021). Disproportionate Impacts of Wildfires among Elderly and Low-Income Communities in California from 2000–2020. *International Journal of Environmental Research and Public Health*, *18*(8), 3921. https://doi.org/10.3390/ijerph18083921

Middleton, J., Cunsolo, A., Jones-Bitton, A., Wright, C. J., & Harper, S. L. (2020). I ndigenous mental health in a changing climate: a systematic scoping review of the global literature. *Environmental Research Letters*, *15*(5), 053001. https://doi.org/10.1088/1748- 9326/ab68a9

National Public Radio. (2021). For over a century, California banned Indigenous cultural fires. Now, that's changing. *NPR*. https://www.npr.org/2021/12/27/1068334998/for-over-a-century-california-banned-indigenous-cultural-fires-now-thats-changin#:~:text=Now%2C%20that

Schultz, C. L. & Harris, D.L. (2011). Giving voice to nonfinite loss and grief in bereavement. In Neimeyer, R. A., Harris, D. L., Winokuer, H. R., & Thornton, G. F. (Eds.). *Grief and bereavement in contemporary society : Bridging research and practice* (pp. 235-245). ProQuest Ebook Central https://ebookcentral-proquest-com.proxy.library.nyu.edu

World Meteorological Organization. (2021). Weather-related disasters increase over past 50 years, causing more damage but fewer deaths. *World Meteorological Organization*. https://public.wmo.int/en/media/press-release/weather-related-disasters-increase-over-past-50-years-causing-more-damage-fewer

Nixon, R. (2011). *Slow Violence And The Environmentalism Of The Poor* (pp. 2–10). Harvard University Press.

Penney, V. (2020). It's Not Just the West. These Places Are Also on Fire. *The New York Times*. https://www.nytimes.com/2020/09/16/climate/wildfires-globally.html

Pierre-Louis, K., & Schwartz, J. (2020, September 18). Why Does California Have So Many Wildfires? *The New York Times*. https://www.nytimes.com/article/why-does-california-have-wildfires.html

Puig, D., Calliari, E., Hossain, M.F., Bakhtiari, F. and Huq, S. (2019). *Loss and damage in the Paris Agreement's transparency framework*. Global Governance Institute Policy Brief Series. Technical University of Denmark, University College London, and Independent University Bangladesh. Copenhagen, London and Dhaka.

Silveira, S., Kornbluh, M., Withers, M. C., Grennan, G., Ramanathan, V., & Mishra, J. (2021). Chronic Mental Health Sequelae of Climate Change Extremes: A Case Study of the Deadliest Californian Wildfire. *International Journal of Environmental Research and Public Health*, *18*(4), 1487. https://doi.org/10.3390/ijerph18041487

Simpson, L. R. (2004). Anticolonial Strategies for the Recovery and Maintenance of Indigenous Knowledge. *American Indian Quarterly*, *28*(3/4), 373–384. https://www.jstor.org/stable/4138923?seq=1&cid=pdf

Smith, K.R., Woodward A., Campbell-Lendrum D., Chadee D.D., Honda Y., Liu Q., Olwoch J.M.,

Revich B., & Sauerborn R. (2014). Human health: impacts, adaptation, and co-benefits. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel,A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge, United Kingdom: Cambridge University Press.

Stone, M. (2021). Weather disaster-related deaths are down—warming could undo that trend. *National Geographic*. https://www.nationalgeographic.com/environment/article/weather-disaster-related-deaths-are-downwarming-could-undo-that-trend

Sugg, M. M., Runkle, J. D., Hajnos, S. N., Green, S., & Michael, K. D. (2022). Understanding the concurrent risk of mental health and dangerous wildfire events in the COVID-19 pandemic. *Science of the Total Environment*, *806*(1), 150391. https://doi.org/10.1016/j.scitotenv.2021.150391

The Society for Human Resource Management. (2016). SHRM Survey Findings: Paid Leave in the Workplace. In *SHRM*. https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/pages/2016-paid-leave-in-the-workplace.aspx

To, P., Eboreime, E., & Agyapong, V. I. O. (2021). The Impact of Wildfires on Mental Health: A Scoping Review. *Behavioral Sciences*, *11*(9), 126. https://doi.org/10.3390/bs11090126

Tripp, B. (2020). *Our land was taken. But we still hold the knowledge of how to stop mega-fires | Bill Tripp*. The Guardian. https://www.theguardian.com/commentisfree/2020/sep/16/california-wildfires-cultural-burns-indigenous-people

United Nations. (2016). *The Paris Agreement*. United Nations. https://unfccc.int/sites/default/files/resource/parisagreement_publication.pdf

United Nations Framework Convention on Climate Change. (2021). *NDC Synthesis Report*. UNFCCC.

https://unfccc.int/sites/default/files/resource/cma2021_08_adv_1.pdf

U.S. Surgeon General. (2021). *Protecting Youth Mental Health: The U.S. Surgeon General's Advisory*. https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf

Weir, K. (2020). Grieving life and loss. In *American Psychology Association*. American Psychology Association. https://www.apa.org/monitor/2020/06/covid-grieving-life

Williams, A. P., Abatzoglou, J. T., Gershunov, A., Guzman-Morales, J., Bishop, D. A., Balch, J. K., & Lettenmaier, D. P. (2019). Observed Impacts of Anthropogenic Climate Change on Wildfire in California. *Earth's Future*, *7*(8), 892–910. https://doi.org/10.1029/2019ef001210

Wilson, K. J., Bell, T., Arreak, A., Koonoo, B., Angnatsiak, D., & Ljubicic, G. J. (2020). Changing the role of non-Indigenous research partners in practice to support Inuit self-determination in research. *Arctic Science*, *6*(3), 127–153. https://doi.org/10.1139/as-2019-0021

Wilson, S. (2001). What is Indigenous research methodology? *Canadian Journal of Native Education*, 25(1), 175-179

The Influence of Affluence on Prosocial Behavior

Daria Fomina, Amy Goltermann, Claire Elise Berner, Stephen Spivack, Theadora Bulajic, Jennifer Freda, Amelia Karim, Helena Julia Torres-Siclait, Jinge Ren, Alexis Egazarian, Jennifer Marina Perez, Stephanie Devli, Victoria Tong, Andrea Poinçot-Leopardi, Samantha Golden, Pranav Lowe, Jonah Zinn, Sagar Shah, Garrett Ienner, Alon Florentin, Lucy Cranmer, John Yaurimo, Morolayo Ayodele, Barbara Angie Clergé Boirond, Naud Jacob Zwier Veldhoen, Sahar Hafezi, Dylan Tossavainen, Huidi Yang, Nkiruka Olivia Marie Amu, Shelby McClelland, Corresponding author: Pascal Wallisch

Department of Psychology, New York University

Author contributions: PW designed the study and analyzed the data. DF & AG drafted the manuscript. DF, AG, CEB, SS, TB, JF, AK, HJTS, JR, AE, JMP, SD, VT, APL, SG, PL, JZ, SS, GI, AF, LC, JY, MA, BACB, NJZV, SH, DT, HY, NOMA, SM recorded the data. All authors reviewed and revised the manuscript and approved the final version.

Acknowledgements

We would like to acknowledge New York University, the Department of Psychology, and Andy Hilford for supporting our research. We would also like to thank the senior administration of the College of Arts and Sciences for sponsoring our research through the Dean's Undergraduate Research Fund.

Abstract

Popular wisdom has it that excessive material wealth leads to decreased prosocial behavior. This notion has empirical support in the literature, but there are open questions about how strong, specific, and general this effect is. In this study, we aimed to test the hypothesis that increased socioeconomic status (SES) is associated with decreased prosocial behavior in a high-powered laboratory task. We find that there are no statistically significant differences in generosity as a function of social class. However, there are subtle - yet statistically significant - patterns linking SES and dark triad personality traits. We conclude that the relationship between SES and social behavior is considerably more nuanced than commonly believed.

Keywords: Levenson Self-Report Psychopathy Scale (LSRP), Dark Triad Dirty Dozen, Psychopathy, Narcissism, Selfishness, Generosity, Socioeconomic status, Affluenza

Introduction

Some studies have suggested that people of means tend to behave worse towards others and break the law more frequently than people from lower socioeconomic classes (Piff et al., 2012; Piff & Robinson, 2017). This pattern of behavior has been dubbed the "Asshole Effect" (Manne, 2014; Leinhart, 2019). The notion that material wealth is detrimental to integrity has a long intellectual history, dating all the way back to the Bible: "And again I say unto you, It is easier for a camel to go through the eye of a needle, than for a rich man to enter into the kingdom of God."(King James Bible, 1769/2017, Matthew 19:24).

More recently, the existence of this effect has been tested - and supported - empirically in a series of experiments, as follows.

In a classic study, participants played a game of Monopoly that gave the advantage to some randomly selected participants by allocating them double the money and the ability to move the pieces twice as fast across the board. Even though these advantages were conferred randomly and thus being unearned, these "rich" players started to exhibit displays of social dominance, power, and celebration (Piff, 2013). When these rich players were questioned about their experience, they attributed their success to their actions, as opposed to luck or their unearned advantages (Piff, 2013). However, there are serious concerns about this interpretation. First, as these behaviors are exhibited in a game, it is unclear as to whether they would translate to the real world. Moreover, it is quite possible that participants were just excited about winning the game - no matter how. In other words, it is unclear whether these displays signified social dominance or just excitement.

However, the shortcomings of this laboratory experiment were complemented by a study with high ecological validity, in which observers stood at a busy intersection to observe whether drivers cut off other cars, the tendency to engage in this behavior was correlated with "vehicle status." (Piff et al., 2012). However, in this study, vehicle status was assumed to be a reliable proxy for a person's social rank and wealth, which is not necessarily valid: there are many potential confounding variables (such as in a situation of emergency) that could have influenced drivers to cut one-another off unrelated to "vehicle status". Moreover, lower income households are known to procure vehicles beyond their means, particularly for short periods of time (Kurz & Li, 2015). In addition, even though participants were naive and blind to the hypothesis, calling a "cut-off" is ultimately based on a judgment call. As Berkeley students have well documented left-leaning tendencies (University of California, Berkeley, 2020), it is not implausible that their observations might simply confirm their anti-wealth biases.

Even in the face of such concerns - and others, including the notion that greed was never properly operationalized in any of these studies, this general idea also makes sense from the perspective of basic psychology, specifically learning theory. It is widely accepted that behavior is under operant control (Skinner, 1948). In other words, behavior improves if it has fitting consequences. People who are misbehaving by acting anti-socially will refrain from such behavior if they are punished - or otherwise negatively reinforced - for doing so. Conversely, it is plausible that people of means are buffered from the consequences of their poor behavior. Thus, we would predict that these people will exhibit progressively antisocial behavior.

Therefore, the existence of this effect would make sense theoretically and seems supported by both controlled laboratory experiments and field studies.

However, there is reason to be skeptical about the generality and size of this effect. For instance, about ~95% of high-income households give to charity and are the income group with the largest donation rate as a percentage of income that makes 10 mil + USD/year (Meer & Priday, 2020)." In addition, field experiments have shown that affluent people who receive an unsolicited envelope with money are more likely to return this envelope than less affluent people (Andreoni et al., 2017), directly contracting the predictions from previous studies (Piff et al., 2010). However, there are many differences between this design and the original studies (e.g., an international setting, different currencies, etc.) that it is difficult to know what factor is causally responsible for the differences in outcome. In addition to these caveats - perhaps the wealthy simply have excess funds to spare - but could still be treating their fellow human poorly in other respects. Ironically, concerns have been raised about the integrity of the affluence causing selfishness (Francis, 2012), so perhaps it is not just the wealthy who have an ethics problem.

Therefore, in this study, we aim to resolve these apparent contradictions. Specifically, we will test whether social class has implications for a

tendency to engage in prosocial behaviors.

Method

In order to study this issue empirically, we employed the following methods.

Participants

Undergraduate students were recruited from New York University via the SONA Systems Portal and participated in the study for course credit. As adequately high statistical power is necessary (Wallisch, 2015), a total of 622 participants (404 female, 195 male, 23 nonbinary or not disclosed) completed the study with the average age in our sample being 20.3 years.

Procedure

Participants began the study by signing the informed consent form upon being briefed about the study. Participants were then trained on how to use the experimental interface, which we had created in MATLAB. For the duration of the study, participants sat alone in a testing room with the computer and the study on full screen. There was no time limit to answer the questions; however, on average, the participants took two hours to complete the study. All questions in the study were randomly interleaved, drawing from the Levenson Self-Report Psychopathy Inventory (LSRP), the "Dark Triad Dirty Dozen Test" inventory, and a generosity task that was inspired by Jones & Rachlin (2006). Participants also completed questions about demographics as well as their self-indicated social class. Upon completion of the study, the participants were properly debriefed. All procedures were approved by the IRB at New York University (UCAIHS).

Measures

The three instruments used in this study - Levenson Self-Report Psychopathy Inventory (LSRP), the Dark Triad Dirty Dozen (DTDD), and measures of generosity each contain items presented to the participants in a randomized order to each participant to avoid order effects.

Dark Triad Dirty Dozen Scale

The Dark Triad Dirty Dozen Test (DTDD) is a 12-item personality inventory that consists of three facets: Machiavellianism, narcissism, and psychopathy (Jonason & Webster, 2010). The participants are asked to rate each given item on a 7-point Likert scale, with 1 implicating strong disagreement and 7 meaning strong agreement. DTDD is considered to be a reliable and valid test (Jonason & Webster, 2010; Lee et al., 2013).

Levenson Self-Report Psychopathy Scale

The Levenson Self-Report Psychopathy Scale (LSRP) is a 26-item personality inventory that measures psychopathy on a 5-point Likert scale (Levenson, Kiehl, & Fitzpatrick, 1995). The LSRP presumes that psychopathic traits divide into two dimensions - primary and secondary psychopathy, where primary refers to lifestyle choices and secondary to emotional responses (Vaughn et al., 2009). The LSRP is considered to be a reliable and a valid test (Bowling, 2005; Brinkley et al.; Falkenbach et al., 2007; Fritz, & Lim, 2018; Gummelt, Anestis, & Carbonell, 2012; Henrich, Heine, & Norenzayan, 2010).

Generosity

During the social decision-making task, the participants had to make a decision between receiving or losing a certain amount of hypothetical money ($20) or someone else receiving/losing a larger sum of money (Jones & Rachlin, 2006). In the task, there are six monetary amounts ($20 to $105), six social distances, and the possibility of receiving/losing the money, yielding a total of 72 unique trials, fully crossed. The responses were classified into two categories: selfish and selfless. While the selfish category would include the responses in which the participant chose to either gain money or someone else to lose the money, the selfless category would

include the opposite response; someone else gains money or the participant loses the money. Next, we compute a generosity index. The generosity index works in the following way: if the participant picked the selfish choice 72 times, they would be classified as 0% generous. Alternatively, if they choose the selfless choice 72 times, they would be classified as 100% generous, with everything in between. In order to prevent the impact of potential response bias, we ensured to randomize the location of the selfish/selfless choice button between left and right.

Socioeconomic status

We asked participants to indicate their socioeconomic status (lower or lower middle class (n = 119), middle class (n = 185), upper middle class and upper class (n = 318)) by self-identification.

Analysis

We analyzed the data recorded using these methods by performing Kruskal-Wallis tests, due to the ordinal nature of our data. Data were analyzed using MATLAB 2019b (Mathworks, Natick, MA). As we perform several tests, we adopt a conservative alpha-level of 0.005 to avoid alpha-inflation (Benjamin et al., 2018).

Results

Does socioeconomic status affect prosocial behavior in a generosity task?

A central prediction of the "Asshole Effect" hypothesis is that people with higher SES would act less prosocially. Here, we operationalized prosocial behavior as generosity in a social discounting task in order to test this hypothesis, see Figure 1.

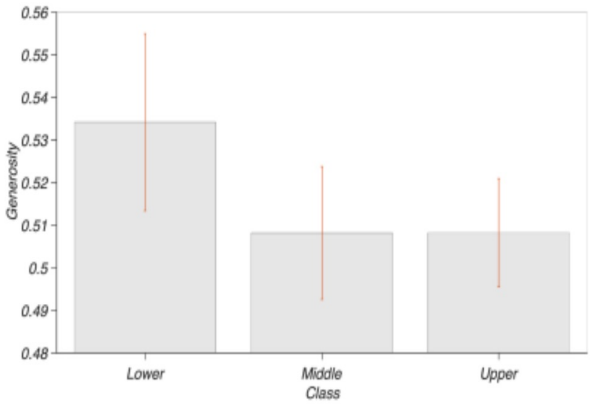

Figure 1: *Generosity as a function of social class in a social discounting task.* The x-axis represents self-identified social class; the y-axis represents the proportion of prosocial choices in a social discounting task. The height of the bar denotes the mean response of the group. Red error bars represent the standard error of the mean.

As shown in figure 1, it is true that participants who identify as part of the lowest social class do exhibit the most generous behavior, but the difference to other social classes is not significant ($H = 0.902$, $df = 2$, $p = 0.64$). Moreover, even if this difference was significant, the effect size would be marginal, as the absolute difference in prosocial behavior between the lowest and the highest social class is about 2 percentage points.

Does socioeconomic status manifest as elevated anti-social traits?

Even if SES does not manifest in a generosity task in a lab, it is conceivable that it shapes a certain outlook on life that could be characterized as an anti-social attitude. This attitude can be captured by the LSRP and Dirty Dozen psychopathy scale. Thus, here we investigate whether this is the case, see Figure 2.

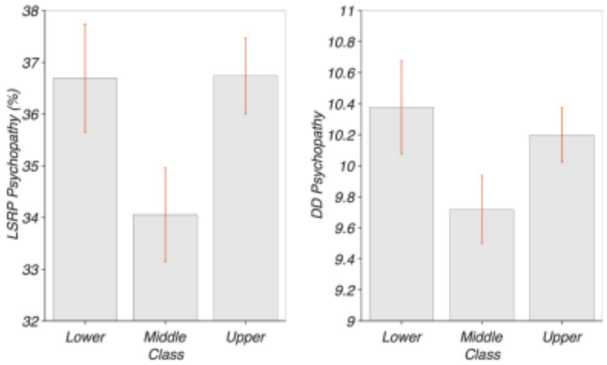

Figure 2: *Psychopathic traits as a function of social class.* The x-axis represents self-identified social class; the y-axis represents the degree of psychopathic traits. The height of the bar denotes the mean response of the group. Red error bars represent the standard error of the mean. Left panel: Psychopathic traits as measured by the LSRP. Right panel: Psychopathic traits as measured by the Dirty Dozen scale.

Figure 2 shows a consistent pattern across both scales - members of the middle class exhibit the lowest degree of psychopathic traits, with both upper and lower classes showing elevated levels relative to that. However, these differences are again not statistically significant: H = 5.271, df = 2, p = 0.072 and H =4.791, df = 2, p = 0.091 for LSRP and DD Psychopathy, respectively. Significance aside, we observe that the absolute difference between these classes is minimal in terms of these measures.

Does socioeconomic status manifest in the form of other dark triad traits?

Even if socioeconomic status does not manifest as a lack of prosocial behavior or an excess of antisocial attitudes, it is possible that it is adjacent traits such as manipulativeness and narcissism that contribute to the poor social reputation of the affluent, as suggested by Piff et al. (2012).

We explore this possibility in Figure 3.

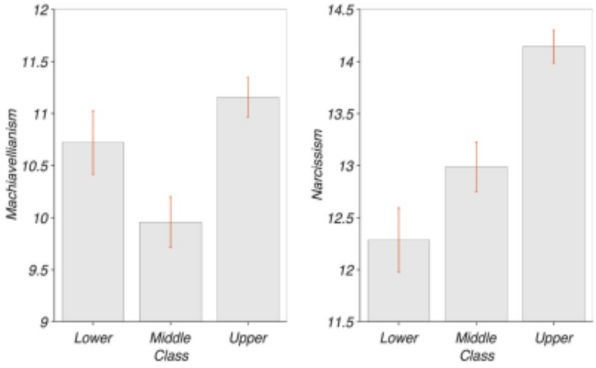

Figure 3: *Dark triad traits as a function of social class.* The x-axis represents self-identified social class, the y-axis represents the degree of dark triad traits, as measured by the Dirty Dozen scale. The height of the bar denotes the mean response of the group. Red error bars represent the standard error of the mean. Left panel: Machiavellianism. Right panel: Narcissism.

Here, we find another consistent pattern - participants who self-identified as members of the upper class were highest in terms of exhibiting dark triad traits such as Machiavellianism and Narcissism, and these differences are both significant: H = 14.243, df = 2, p < 8.07e-04 and H = 35.825, df = 2, p = 1.6623e-08 for Machiavellianism and Narcissism, respectively.

Does narcissism impact generosity?

Finally, to come full circle, we wonder whether narcissism is linked to generosity, even though SES is not. In a way, this can be considered as a manipulation check, as it is almost a foregone conclusion that increased narcissism would be associated with decreased generosity. Indeed, that is what we find, see Figure 4 - although there is considerable variability.

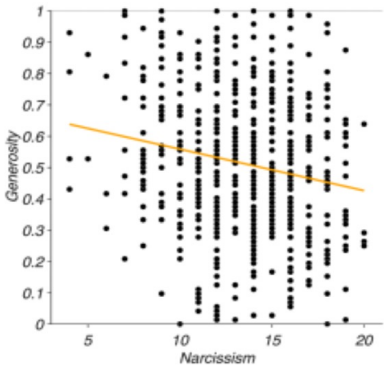

Figure 4: *Generosity as a function of narcissism.* The x-axis represents the Dark Triad Dirty Dozen score of an individual participant. The y-axis represents the generosity score of an individual participant. Each black dot depicts data from an individual participant. The orange line represents the least squares best fit lines.

This is an interesting pattern of results - increased narcissism is associated with decreased generosity. However, this association - while highly significant ($p = 2.58e-6$) is quite weak - ($r = -0.187$), due to the considerable scatter visible in Figure 4. In other words, this allows for a dissociation between these variables - SES is linked to narcissism, and narcissism is linked to generosity, but SES is not linked to generosity, suggesting a highly dimensional space underlying these measures. Taken together, this nuanced pattern of results does increase our confidence in the validity of our findings.

Discussion

The question as to whether affluence causes a decrease in prosocial behavior has been studied for many years, yet previous attempts at answering this question have led to contradictions.

Here, we revisit this question with a high-powered and diverse sample in a generosity task under carefully controlled conditions. Doing so, we found that socioeconomic status is not predictive of prosocial behavior in this task. However - whereas differences in psychopathic traits were not significant, there are significant differences in other dark triad traits, with members of higher social classes exhibiting stronger such traits. That said, these differences are subtle in terms of the absolute effect size and - as such - probably cannot account for the differences claimed by proponents of the "asshole effect" hypothesis. In light of Piff et al. (2010, 2012, 2014, 2017), it is surprising that the effects of "affluenza" (Hayes, 2013; The New York Times, 2014; Frost, 2017) - having such ample means that they start to be deleterious for the development of proper social behavior - are so negligible. However, perhaps the operationalization of antisocial behavior in those original studies was too open to interpretation. Nevertheless, we do observe an interesting pattern of results, with people in the middle class usually exhibiting the lowest levels of psychopathic or machiavellian (traits. It stands to reason that members of the lower classes, by definition, have fewer material resources and there is less of a buffer to cushion unexpected events. Therefore one could argue that manipulation might be an adaptive survival strategy. For instance, someone who cannot afford the essential services, might be tempted to acquire them by social engineering. Conversely, members of the upper classes might be manipulative in other ways, but not be as likely to be sanctioned and therefore suffer fewer consequences than their less wealthy counterparts. This pattern of results is in line with Andreoni et al. (2017) - arguably, people from a low SES background are more likely to keep the unexpected windfall because they need the money more.

Whereas we believe we found a compelling pattern of results, there are several limitations of this study. First of all, most of our participants are drawn from the pool of Psychology students at New York University. It is well known that such students are more likely to be unrepresentative in several important ways, including an increased level of agreeableness (Henrich et al., 2010; Litten et al., 2018,). In other words, these findings might not generalize to a more representative sample of the population. Moreover, not many members of our sample were genuinely in the "upper class," nor did many come from true poverty - in other words, most of our participants hail from different shades of the middle class. The coarseness of these SES brackets might obscure true differences in behavior or traits of people from extreme poverty vs. extreme wealth. This issue is compounded by the fact that our SES measures are self-reported. Some participants might simply be unaware of their social class. In addition, our sample is rather young. It would be quite informative to compare young wealth - which almost by definition is unearned - with the wealth of older people, which might be earned. However, it stands to reason that it is perceived social class, not actual financial resources that drive the psychological effects resulting from SES. Finally, whereas we did not experimentally create wealth, which - in principle - limits the causal scope of conclusions one can

draw from such results, this concern is not applicable to our study, as one should see deleterious effects of affluence on behavior, if the original hypothesis was true. That said, strictly speaking, we cannot assess whether - to put not too fine a point on it - an attitude of entitlement, which underlies much of narcissism, as measured by the Dirty Dozen Scale (Kowalchyk et al., 2021) leads to affluence, or whether the affluent can afford to exhibit such an attitude. Yet, this is where the age of our sample works in our favor - due to the youth of our sample, it is implausible that the attitude created the wealth, it is more plausible that it is the wealthy background that creates the attitude of entitlement.

These limitations provide an opportunity for future research. This research might be focused on either recruiting a more representative sample, or specifically targeting participants from extreme wealth backgrounds, to amplify the contrast between extreme poverty and extreme wealth, and include a wider age range. Finally, it might be worthwhile to further elaborate on the conceptual distinction between selfish and unethical behavior (Dubois et al., 2015).
That said, we did not find that affluenza strongly modulates prosocial behavior or dispositions. Instead, we found a compelling and plausible pattern of results across multiple behavioral and dispositional domains.

References

Andreoni, J., Nikiforakis, N., & Stoop, J. (2017). *Are the Rich More Selfish than the Poor, or Do They Just Have More Money? A Natural Field Experiment* (Working Paper No. 23229). National Bureau of Economic Research.

Benjamin, D. J., Berger, J. O., Johannesson, M., Nosek, B. A., Wagenmakers, E.-J., Berk, R., ... Johnson, V. E. (2018). Redefine statistical significance. *Nature Human Behaviour*, *2*, 6–10.

Bentham, J. (1789). *An introduction to the principles of morals and legislation*.

Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health (Oxford, England)*, *27*, 281–291.

Brinkley, C., Schmitt, W., Smith, S., & Newman, J. (2001). Construct validation of a self-report psychopathy scale: Does Levenson's self-report psychopathy scale measure the same constructs as Hare's psychopathy checklist-revised? *Personality and Individual Differences - PERS INDIV DIFFER*, *31*, 1021–1038.

Christopher, K., & Geng, L. (n.d.). FRB: FEDS Notes: Who Drives Luxury Cars (Only for a While)? https://www.federalreserve.gov/econresdata/notes/feds-notes/2015/who-drives-luxury-c ars-20150601.html

Falkenbach, D., Poythress, N., Falki, M., & Manchak, S. (2007). Reliability and validity of two self-report measures of psychopathy. *Assessment*, *14*, 341–350.

Francis, G. (2012). Evidence that publication bias contaminated studies relating social class and unethical behavior. *Proceedings of the National Academy of Sciences*, *109*, E1587–E1587.

Frost, D. J. (2014, February 20). Bat Kid and "affluenza": The moral psychology of empathy. Medium., https://davidjfrost.medium.com/bat-kid-and-affluenza-the-moral-psychology-of-empathy-488a631948 0e

Gummelt, H. D., Anestis, J. C., & Carbonell, J. L. (2012). Examining the Levenson Self Report Psychopathy Scale using a Graded Response Model. *Personality and Individual Differences*, *53*, 1002–1006.

Hayes, A. (2013, December 13). 'Affluenza': Is It Real? CNN. https://www.cnn.com/2013/12/12/health/affluenza-youth

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*, 61–83.
Jonason, P., & Webster, G. (2010). The Dirty Dozen: A Concise Measure of the Dark Triad. *Psychological Assessment*, *22*, 420–432.

Jones, B., & Rachlin, H. (2006). Social Discounting. Psychological Science, 17, 283–286. Kant, I., & Paton, H. J. (1964). Groundwork of the metaphysic of morals.

Kowalchyk, M., Palmieri, H., Conte, E., & Wallisch, P. (2021). Narcissism through the lens of performative self-elevation. Personality and Individual Differences, 177, 110780.

Lee, K., Ashton, M. C., Wiltshire, J., Bourdage, J. S., Visser, B. A., & Gallucci, A. (2013). Sex, power, and money: Prediction from the dark triad and honesty–humility. European Journal of Personality, 27(2), 169–184.

Leinhart, R. (2019, January 18). The Asshole Effect. https://chasingless.com/2019/01/17/the-asshole-effect/

Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutionalized population. *Journal of*

Personality and Social Psychology, *68*, 151–158.
Litten, V., Roberts, L. D., Ladyshewsky, R. K., Castell, E., & Kane, R. (2018). The influence of academic discipline on empathy and psychopathic personality traits in undergraduate students. *Personality and Individual Differences*, *123*, 145–150.
Manne, A. (2014, July 7). The age of entitlement: How wealth breeds narcissism. *The Guardian*. https://www.theguardian.com/commentisfree/2014/jul/08/the-age-of-entitlement-how-w ealth-breeds-narcissism
Meer, J., & Priday, B. A. (2020). *Generosity Across the Income and Wealth Distributions* (Working Paper No. 27076). National Bureau of Economic Research.
13
Miller, J. D., Gaughan, E. T., & Pryor, L. R. (2008). The Levenson Self-Report Psychopathy Scale: An Examination of the Personality Traits and Disorders Associated With the LSRP Factors. *Assessment*, *15*, 450–463.
Piff, P. (n.d.). *Paul Piff: Does Money Make You Mean?* https://www.npr.org/2014/04/04/295360962/does-money-make-you-mean
Piff, P. K. (2014). Wealth and the Inflated Self: Class, Entitlement, and Narcissism. *Personality and Social Psychology Bulletin*, *40*, 34–43.
Piff, P. K., Kraus, M. W., Côté, S., Cheng, B. H., & Keltner, D. (2010). Having less, giving more: The influence of social class on prosocial behavior. *Journal of Personality and Social Psychology*, *99*, 771.
Piff, P. K., & Robinson, A. R. (2017). Social class and prosocial behavior: Current evidence, caveats, and questions. *Current Opinion in Psychology*, *18*, 6–10.
Piff, P. K., Stancato, D. M., Côté, S., Mendoza-Denton, R., & Keltner, D. (2012). Higher social class predicts increased unethical behavior. *Proceedings of the National Academy of Sciences*, *109*, 4086–4091.
Skinner, B. F. (1948). "Superstition" in the pigeon. *Journal of Experimental Psychology*, *38*, 168.
The MathWorks, Inc. (n.d.). *MATLAB and Statistics Toolbox Release 2019b*. Natick, Massachusetts, United States.
The New York Times. (2014, February 18). 'Affluenza' and Life Circumstances in Sentencing. The New York Times. https://www.nytimes.com/roomfordebate/2014/02/18/affluenza-and-life-circumstances-in-sentencing
UC Berkley. (n.d.). *2020 UCUES: Results and Summary*.
Vaughn, M. G., Edens, J. F., Howard, M. O., & Smith, S. T. (2009). *An investigation of primary and secondary psychopathy in a statewide sample of incarcerated youth. Youth Violence and Juvenile*.
Who Gives Most to Charity? (n.d.). https://www.philanthropyroundtable.org/resource/who-gives-most-to-charity/

The Conjunction Between Psychology and Propaganda: Propaganda During the Vietnam War and Use of Psychological Warfare

Samantha Gordon

Department of History, New York University

Introduction

It is possible to regard History as a chronological depiction of behavioral human evolution, thus making it theoretically difficult, if not impossible, to separate it from the discipline of psychology. Both regarded as social sciences, history and psychology seem to work together in a reciprocal, symbiotic relationship where one maintains and explains the other in a continuous cycle. A perfect demonstration of this notion lies in the conceptualization and realization of propaganda. While the basic definition of propaganda refers to biased ideas or information which are deliberately fashioned to spread a desired ideology to influence a target population, it – for the purpose of historical theorizing and analysis – can be generalized to the manner in which it's accomplished.

This investigation will focus specifically on psychological warfare and its reciprocal relationship with the instantiation of propaganda using the Vietnam War as a case study. Firstly, it will discuss the general relationship between psychology and propaganda. Secondly, it will establish a definition of psychological warfare in a general context. Thirdly, it will contextualize the Vietnam War and present the American ideology which composes the propaganda they sought to proliferate. Finally, it will discuss the US government's successful implementation of psychological warfare through two main forms: physical destruction and weaponry as a vehicle for psychological terrorization, and indoctrination, understood through the lens of psychological aggression and depicted with methods of torture and intimidation tactics.

Section 1: The Psychology of Propaganda

Propaganda has frequently been the main focal point of discussion among psychologists due to the interrelated nature of history and psychology. With regards to the specific realm of social and developmental psychology, it often arises in literature of these fields as elements of which it is composed, and the consequences of its application are prevalent in several case studies used as examples of psychological principles (Money-Kyrle 82). This section will discuss the psychological basis of the mechanisms by which propaganda functions, the devices a nation could use to ensure its efficacy, and the developmental psychology's rationale for why propaganda works.

Prior to influencing an individual, they must first perceive the stimulus-situation by which they will be affected, meaning a situation must stand out from their state of normalcy (Doob 90). An immediate concern which arises – from a socio-psychological and evolutionary perspective – when examining the mechanisms by which propaganda must function and conditions necessary for its success, is that of agitation. If the average individual were to easily and rapidly recognize a change in their environment and conceptions, they would inherently oppose it, or at the very least would be uncooperative to a certain degree as it would go against their instinct of self-preservation when presented with a foreign agent, principle, or rapid change in environmental factors (Myers).

Thus, the process by which propaganda successfully roots itself must take one of the following two forms: either be an implicit, unconscious, and unintentional absorption of the values subtly but repetitively over time, or an explicit, conscious, and intentional absorption facilitated through the active use of persuasion (Doob 91). It is possible to further break down the latter form into two sub-strategies, one with an ameliorative implication and one with a pejorative. In the positive scenario, the propagator must attempt to make the notions they seek to engender appealing to the target audience (Doob 91). Putting this into the context of political or social conflict, benevolent persuasion could plausibly take the form of negotiations with the promise of a relationship based on reciprocity which would mutually benefit both parties but lend itself more to the propagator. As a result, there would be an imbalance of power, but the extent to which it is unequal is not definite and would vary based on circumstance. In the negative scenario, the propagator does not necessarily have to make any attempt to make their notions appealing. Rather, they could simply assert their beliefs or ideologies and use retroactive, and thus often explicit, forms of persuasion (Doob 91). Placing this notion in the context of political or social conflict, malicious coercion takes the form of intimidation, threats, and consequences in which there is no reciprocal relationship, but an unequal one which lends itself exclusively to the propagator with an undeniable imbalance of power.

Moving beyond the mechanisms by which it functions, successful propaganda faces another obstacle: that of uncertainty. While a nation seeking to propagate may employ one of the aforementioned strategies, this does not in and of itself guarantee its effectiveness, and unpredictability is not a factor within its control (Doob 91). As a result, propagators often employ devices which seek to reduce it. One source of unpredictability comes from dissenters, as they threaten to rival the values a propagator seeks to instill. An effective tool which counteracts the impact of dissent lies in bolstering the voices of the submissive (Doob 92). If a prominent figure, for instance, were to show signs of public support, they would therein act as a device. The propagator could simultaneously use them to widen their audience with a newfound reach to populations that they may previously not have had access to and use them as an instrument of pacification since submissive individuals are suggestible individuals, who respond well to increased messaging and will assume that hearing the same ideology from multiple people is a sign of validity (Doob 92). In bolstering the majority rather than directly counteracting the minority, the propagator can successfully create the "impression of universality" (Doob 92), which further aids in the process of submission regardless of whether it is a false impression.

The fundamental reason why propaganda works is because of the suggestibility of man (Money-Kyrle 82). If evidence and judgment were the only factors which dictated humans' beliefs and feelings, it would be far less likely that phenomena such as the propagation of an ideology, and especially one of particular controversy for reasons of injustice, would work. The question is no longer *whether* humans are suggestible, but *why* they are and for what reasons they differ. Theorists such as Money-Kyrle have suggested that the reason behind human suggestibility and individual differences in the extent to which they are suggestible stems from differences in development. Although every individual goes through the same general phases of development – physically, psychologically and socially speaking – *smooth* development is "easily disturbed" (Money-Kyrle 83). In normal development, a child will absorb the qualities of their immediate others through imitation. In an environment where the people surrounding them have admirable qualities such as balance and independence which they seek to imitate, as the child ages, they will consistently have models off of which they will base their character (Money-Kyrle 83). This will result in the healthy development of an independent individual who will eventually act as a model for their child. However, the right

circumstances necessary for normal development are not universal, and therein lies the discontinuity. The development of a child's character can be stunted if they are not presented with a character who contains traits they seek to replicate. If they are unable to find models off of which they initially base their character during the dependent-stage of life, this theory posits that they will not reach the expected stage of independence and instead remain semi-dependent with little inner support and conviction (Money-Kyrle 84). This lack of independence is ultimately what makes them easily influenced by others and their beliefs.

Having understood this initial, developmental element which leads to variation in degrees of suggestibility, there is one further component which works in tandem with the first. Suggestibility to propaganda depends on the conjunction between a target's independence (or lack thereof) of character *and* the qualities of the propagator. Individuals who have not adequately developed, and thus have an inherent desire to find someone upon whom they can depend, are particularly vulnerable to the influence of those they may naively deem as 'good', although their abstraction may not always be accurate (Money-Kyrle 85-86). The reason for their suggestibility lies in their desire to have someone protect them from persecution, however – as a result of their deficit in independence and maturity – they are not always the best judges of character.

Section 2: Defining Psychological Warfare

The generally accepted definition of psychological warfare is that it is the abstraction of actions intended to reduce oppositional morale using tactics to intimidate or otherwise persuade individuals and collective wholes alike into submission. However, this is an oversimplification and perhaps even a reduction of what it is. During a lecture delivered at the Naval War College, Charles H. Smith, presented the Dictionary of Military Terms for Join Usage's understanding of psychological warfare. It defines this military strategy as a nation's planned use of propaganda, designed to influence its target's psyche, regarding its "opinions, emotions, attitudes and behavior[s]" (Smith 43), regardless of whether said target is an opposing, neutral, or affiliated party.

What becomes evident in this conception is the fact that it is essential to understand this term from the perspective of its target, as psychological warfare is simply hypothesized and not actualized until an operation produces an effect on its recipient. Smith articulates a structural model in which psychological warfare is the application of psychological power, and the latter is composed of the agglomeration of four powers: political, ideological, economic, and military power (Smith 44-45). From the perspective of the recipient, political power refers to what the nation utilizing it wants, visible in its doctrines and policies. Ideological power refers to the nation's beliefs and can be understood as the image which comes to mind when thinking of what is emblematic of that nation. Economic power refers to the nation's fiscal stance, be that their ability to finance a war in the event of conflict or the ability to lend aid in the event of peaceful negotiation. Finally, military power refers to the nation's ability to both act on the defensive or offensive in the event of conflict but is not limited to weapons of destruction and instead encompasses aspects of the three powers which precede it (Smith 46). Having understood the general meaning of psychological warfare, it is now possible to examine its place within the context of the Vietnam War.

Section 3: Contextualizing the Vietnam War and American Ideology

Prior to delving into the ways in which psychological warfare was implemented during the Vietnam War, it is crucial to understand the American perspective and rationale for entering it to begin with. Analysts such as Chomsky have suggested that they waged a war with the primary goal of destroying the North Vietnamese Government and National Liberation Front's

nationalist movement (Chomsky 418). Commentators have argued that although they were aware that they were opposing a revolutionary group whose primary motivation came from a nationalistic ideology and not the ambition to create a Communist state, what was best for Vietnam was not the concern. The United States had a pre-existing, and long-term agenda to eliminate Communism in Indochina by any means necessary in order to prevent further spread of its influence in non-affiliated nations, which would both directly and indirectly inhibit the expansion of the 'free world' and 'free world economy' integral to the American identity (Chomsky 430). It is possible to argue that there was never a question of whether America should intervene in conflicts in the Pacific, rather, there was no other option if it wanted to preserve its ideology. In the eyes of the government, the unification of Vietnam implied a Communist identity, and having already lost the battle in other Asian nations like Laos and Korea, failure was not an option. This narrative not only constitutes the foundations of the war, but also serves as the ideological content they sought to further broaden and develop beyond their domain. It is this pro-American, anti-other sentiment that the United States wished to imbue within other parts of the world, but most notably the areas that were especially vulnerable to Communism.

Section 4.1: The Physicality of Psychological Warfare – Physical Aggression as a Form of Terrorization

While psychological warfare is often thought of as an alternative method to physical violence, it can be argued that methods of physical aggression and destruction are in and of themselves a form of psychological terrorization. It is an incontestable fact that the United States' actions during the Vietnam War are a perfect example of their implementation of physical aggression. Their military strategies consisted of ruthlessly murdering Vietnamese soldiers and noncombatants alike, which was "neither accidental nor unforeseeable" (Turse 14). The American government progressively increased their use of destructive weaponry, specifically designed and strategically implemented, to bolster the amount of damage done to both Vietnam's environment and its people. This section of the analysis focuses on the ways in which the US military caused bodily harm to if not killing the opponent population and destroyed the landscape using explicit cases such as the Speedy Express Operation and the My Lai Massacre, among others.

When looking at the physical brutality of the Vietnam war, the Speedy Express Operation is a prime example due to its severity. It took place in 1969, headed by the US 9th Infantry Division in Kien Hoa. Throughout its run, the military administered 3,381 airstrikes deploying napalm, explosives, and anti-bombs. This ultimately resulted in the deaths of 10,899 victims, 5,000 of which were civilians (Chomsky 424). Such extensive use of firepower went beyond what would have been sufficient if the objective had strictly been one of maintaining the upper-hand in the war. It demonstrates that the government's interests went beyond ensuring control, encompassing a desire to institute fear within the population and terrorize them into submission. An additional example of physical aggression that comes to mind due to its media coverage during the war is the My Lai Massacre. The massacre occurred in 1968 following approval from the Charlie Company, 1st Battalion, 20th Infantry, during the implementation of the Operation Wheeler/Wallowa, a campaign which resulted in the killings of 10,000 Vietnamese (Chomsky 423). Perhaps most disheartening, the majority of the massacres' victims were "old men, women and children" (Turse 228), as soldiers went to such extreme measures as rounding up and shooting families with their babies. Beyond the murders, other physical acts of aggression which took place included the individual and group acts of "rape, sodomy, maiming, [and] assault on noncombatants" (Turse 229). If the United States intention was to terrorize the population, they did

effectively accomplish their goal by blurring the principles of the ethical use of violence.

Moving past exhibitions of physical aggression, another essential element in the physical implementation of psychological warfare is the act of environmental destruction. The use of defoliants, paired with the bombings of entire regions, effectively annihilated the structural foundations of the landscape in virtually every part of the nation and areas like Quang Ngai were particularly affected. By 1963, it is estimated that 70 percent of villages in this province faced destruction by way of napalm strikes which stripped the forests where wildlife once inhabited (Schell 10-13) and anti-personnel bombs which cratered the rice fields and left coconut groves impossible to cultivate (Turse 250). This obliteration of Vietnam's physical environment, paired with the brutalizing and killing of a significant portion of its population are perfect demonstrations of how psychological warfare can inherently be deployed through physical means, and how integral elements of propaganda such as terrorization and intimidation are at the center of its effectiveness.

Section 4.2: The Psychology of Effective Propaganda – Indoctrination Through the Use of Psychological Aggression

Having understood the first of the two main forms of the implementation of psychological warfare in the context of the Vietnam War, this analysis will now address its more conventional aspects. The psychology of effective propaganda revolves around getting inside the mind of the opponent, and in the case of the Vietnam War, by no means was more efficient than indoctrination, facilitated by intimidation tactics and methods of torture. The United States created and put into motion a pacification program (CORDS) in order to mold Vietnam into a nation that went in accordance with their ideology, especially due to the ever-present threat of Communism which during this time was sweeping across Southeast Asia (Chomsky 418). As described by the social psychologist Alex Carey, this program was essentially a "nation-sized sociological experiment" (Chomsky 419) which intended to change the Vietnamese attitudes and values so they would adhere to American ideals. There was a clear lack of consideration for the opponent's objectives of autonomy, and a desire to maintain power while simultaneously diminishing that of Communist states meant that it was in their best interest to indoctrinate the captive population.

With regards to intimidation tactics, a prime example is the dropping of leaflets – a popular form of propaganda – over the Quang Ngai province, with one million leaflets dispensed per day (Schell 47). While it was mandated that leaflets and announcements be distributed prior to bombings to provide time for civilian evacuations, there was a simultaneous malicious intent in doing so because it served as a weapon of demoralization. In his work, *The Military Half*, Jonathan Schell described one of the many leaflets, No. 244-279-67. It featured an illustration of a house being bombed with a text reading: "if the Vietcong do this... your village will look like this" and another inscription on the back warning that "the military forces of the GVN and the free world have no desire to harm the innocent people of Vietnam who are willing to live in peace. However, if the criminal Vietcong are allowed to hide in your house, both they and your house will be destroyed" (Schell 22). The inherently vulgar imagery and brutal language used in this example have a bi-tonal approach and effect. On one hand, it instills fear in the noncombatant population with the visual and written threat of losing their home and possessions in the best case scenario, and death in the worst. On the other hand, it thinly veils the insidious nature of their message by stating that the government does not *wish* to take such drastic measures which simultaneously allows for the deflection of American responsibility and the creation of unsettling uncertainty in the Vietnamese population, dissuading them from aiding American enemies. Other leaflets' content ranged from short texts such as the aforementioned, to explicit and

graphic images of mutilated soldiers before and after torture or implosion (Schell 25) – all of which hold an implicit memo seeking to establish submission through fear.

With regards to methods of torture, no member of the Vietnamese community was exempt from terrorization and brutalization. Both soldiers and civilians were tortured, but with different motives. As for the soldiers, the incentive was to elicit confessions and get them to divulge information. In an interview conducted by Schell, a man recounted seeing a Sergeant tether a captive Viet Cong soldier "upside down by the feet to the runners of a chopper and drag him three thousand feet in the air, swinging over the paddies" (Schell 42). He also described several other captive soldiers being forced into a helicopter and once off ground, being pushed out if they refused to disclose information (Schell 43). While methods of physical torture such as these were standard procedure, this by no means diminishes its psychologically aggressive nature. More to the fact, high-ranking officials had the authority to decide the fate of all men, as the term 'soldier' was often generalized and therefore encompassed noncombatants with a certain frequency although these methods were reserved for enemy troops personnel. A liberal license to torture undermines the validity of this use of physical brutality, but in a sense, it is the perfect depiction of effective propaganda. Any individual, regardless of legitimacy of claims suggesting they were actively involved in combat, could be subject to this extreme measure of psychological and physical agony. Arguably, there is no better way to ingrain fear within an intended audience.

As for the civilian population, there were different methods based on the demographic they fit into, but the motive remained the same: to traumatize them into submission. In the case of the Vietnam War, civilians can be categorized into two groups – the general population and the 'disabled'. The former was subjected to various traumas of war, such as beatings, witnessing the death of loved ones, and humiliation. For instance, in 1966, a rampage in the hamlet of Xuan Ngoc included the gang-rape of Bui Thi Huong, an 18-year-old girl, and the butchering of her entire family (Turse 223). A few years after, another young woman named Phan Thi Mao was kidnapped, gang-raped and murdered (Turse 223). In 1969, a group of soldiers tortured and murdered the family of a man named Do Van Man who they assumed to be a Viet Cong despite having no evidence. First, they humiliated him by stripping him naked and "manhandle[ing]" him, and then they tortured him by tying him to a tree to beat him in view of his wife and children before finally shooting him (Turse 225). A particularly sinister feature of these illustrations of torture is that of the American soldiers' total lack of empathy and disregard for human life. Events like these were commonplace, demonstrating the extent to which Americans used this common form of propaganda as a means of indoctrination. With regard to the second group of civilians, the 'disabled', methods of torture took the form of experimentation conducted by an American psychiatrist. He subjected patients in mental hospitals to "unmodified electroconvulsive shock which produc[ed] systematic convulsions similar to a grand mal epileptic seizure" (Chomsky 419). It can be put in no more eloquent terms than Carey's, who said that "to be mentally ill and Asian deprives a man of most of his humanity; to be communist and Asian deprives him of all of it" (Chomsky 420). This framework applied in the minds of scientists and military officials alike, as their actions lacked compassion in both the battlefield and the laboratory. This was an innately unethical use of captive, non-consenting patients who were seen as disposal objects which concurrently furthered American scientific advancements and served as another means of general torment within the realm of psychological warfare.

Conclusion

With regard to the chosen case study of this paper, there are several reasons for which the Vietnam War is an apt demonstration of the

interconnectivity of psychology and propaganda, but there are two which are particularly striking. Firstly, the American rationale is rather transparent in this conflict, and is inherently rooted in its ideology – a compulsory element in propaganda. Secondly, the sheer number of and diversity in psychological tactics is overwhelming considering the size and power of the American military in comparison to its Vietnamese counterpart. Granted, there are instantiations throughout history – some also taking place within the Cold War Era – that could similarly fulfill this role, but when looking for an unconventional case study to examine an abstract concept such as the one in this investigation, it brings a new perspective that does not often appear in historical or psychological literature, and especially not within this narrative framework.

With regard to the larger discussion at hand, the domain psychology – specifically psychological warfare – and concept of propaganda are intrinsically intertwined on two levels: the first being that propaganda is necessary in the facilitation of psychological warfare, and the second being that socio-psychological principles form the basis of and are necessary for the effectiveness of propaganda. Thus, one could argue that they have a symbiotic relationship, fueling one another in a perpetual cycle seen throughout most political and armed conflicts in history. Ultimately, what this analysis attempts to convey is that fundamentally, one cannot exist without the other. It is within human nature to fear the inevitability of change, a phenomenon often originating from disagreement over satisfaction with the current state of being. Yet to be in constant agreement with one another would imply the removal of individual variation – a fundamental truth within the composition of human beings. Unequivocally, new conflicts will continue to present themselves upon the resolution of their predecessors. Therefore, in a time of political complexity and incontestable inequality, history will continue to repeat itself in a cycle which mimics that of propaganda's relation to psychology, while these very notions are used to facilitate it.

References:

Chomsky, Noam. "An Act of Imperialism." *Light at the End of the Tunnel: A Vietnam War Anthology*, edited by Andrew J. Rotter, 3rd ed., Rowman & Littlefield Publishers, 2010, pp. 414-31.

Doob, Leonard W., and Edward S. Robinson. "Psychology and Propaganda." *The Annals of the American Academy of Political and Social Science*, vol. 179, [Sage Publications, Inc., American Academy of Political and Social Science], 1935, pp. 88–95, http://www.jstor.org/stable/1020283.

Linebarger, Paul M. A. "PSYCHOLOGICAL WARFARE." *Naval War College Information Service for Officers*, vol. 3, no. 7, U.S. Naval War College Press, 1951, pp. 19–47, http://www.jstor.org/stable/44792590.

Money-Kyrle, R. "The Psychology of Propaganda." *British Journal of Medical Psychology*, vol. 19, no. 1, Sept. 1941, pp. 82-94, bpspsychub-onlinelibrary-wiley-com.proxy.library.nyu.edu/doi/10.1111/j.2044-8341.1941.tb00312.x.

Myers, David G., and Jean M. Twenge. *Social Psychology*. 13th ed., New York City, Mc Graw Hill Education, 2019.

Schell, Jonathan. *The Military Half: An Account of Destruction in Quang Ngai and Quang Tin*. New York, Vintage Books, 1968.

Silverstein, Brett. "Toward a Science of Propaganda." *Political Psychology*, vol. 8, no. 1, [International Society of Political Psychology, Wiley], 1987, pp. 49–59, https://doi.org/10.2307/3790986.

Smith, Charles H. "PSYCHOLOGICAL WARFARE." *Naval War College Review*, vol. 5, no. 6, U.S. Naval War College Press, 1953, pp. 39–61, http://www.jstor.org/stable/44640177.

Turse, Nick. *Kill Anything That Moves: The Real American War in Vietnam*. Picador, 2013.

Beyond Time Relativity, Conscious Relativity Exists as Objective Reality in Human Perception

Junhyuk David Lee

New York University

Abstract

Einstein's time dilation tends to bend fondly over our reality and technologies. However, if one considers our two eyes perceiving two realities of 3D space, one can quickly come to a conclusion that, accurately, the space that one lives in is 4D space where 4D is synchronized by our two eyes into one focal point behind our eyes causing us to believe that our reality is 3D as controlled hallucinations. As Berg and Brenner (1994) state, monocular flow is inferior in perceiving the depth of space compared to binocular eyes as disparities are reflected from disparities of depth through rotation of the head being affiliated with its disparities. In other words, judging by one-eyed people and two-eyed people have differences in calculating distances and time anyhow, it becomes clear that Einstein's time relativity is only explained in physics terms of time rather than how our mind perceives time. Two eyes integrating perception or consciousness in 4D are therefore named as the conscious relativity theory that governs 3D space of width, height, and length. The 4D perceptions, however, also indicate how time dilation equation ends up slowing down even further from the original equation. In other words, objective reality is therefore a concept of time being 5D and our world as in 4D. Therefore, conscious relativity theory is a state of our objective reality.

Introduction

Einstein once said, one who knows has the duty to make it known (Baron, 2002). Time dilation was his work that led to the invention of the atomic bomb and every GPS system with all other technologies. Particularly for atomic bomb, his E =mc2 equation proved how energy is released from the atomic bomb (Jha, 2014). His theory of time relativity shaped our century's science in all areas. However, even when he said time is an illusion, he might have missed some parts in his theory; his time relativity only exists because people have two eyes. Based on our eyes' structure, people tend to perceive 3D space per eye and synchronize that two 3D into one focal point in their brain (Berg and Brenner, 1994). Thus, it can be concluded based on our perception, that the world is not 3D space but rather 4D with time being one dimension further, which is 5D in objective reality (unlike Einstein's theory that time is relative in 4D). Conscious relativity is, therefore, suggestable as a theory that if one is truly conscious of our reality, the consciousness axis substitutes the time axis in 4D. The fact that two eyes represent 4D means friction in reality perception, hence, conscious relativity theory, whereas time is not the main friction based on our perception. Indeed, Einstein did find the time relativity theory between a standing person and another inside a train. However, that very core of cognitive friction of perceptions even just looking at a stationary factor splits in perception when a two-eyed person becomes a one-eyed handicapped person (Berg and Brenner, 1994). Hence, one will know Einstein is one step behind in perceiving reality in psychological and objective ways.

Time relativity and conscious relativity with their application in shaping the reality of either in time or perception:

Time relativity theory in which time is

dilated in different perceptions is said by its creator of its theory, Einstein; as he stated, "When a man sits with a pretty girl for an hour, it seems like a minute. But let him sit on a hot stove for a minute - and it's longer than any hour. That's relativity," time is relative based on where you stand in space (Buhusi and Meck, 2009, pg. 1). As for the time dilation equation, the wonder of science is as follows based on Urone and Dirks (2012):

$$\Delta t = \frac{\Delta t_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

v = *relative velocity between inertial reference frame*

c = *speed of light in vacuum*

$\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ = *relativity rate or effects*

Δt_0 = *proper time or one position time*

Δt = *stationary time*

When Einstein said time is an illusion, he was aware of it without knowing his very perception of time relativity was based on the distorted illusion of humans having two eyes; in other words, hypothetically, time relativity only exists because one has two eyes to perceive space as 4 dimensional reality (one eye for one 3D space) as objective reality that synchronizes in one focal point inside our head through the lens of our eyes which makes us perceive space as 3 dimensions with time being 4 dimensional. If one shifts this original stereotype to objective reality, one can therefore conclude that space is actually 4D in our two-eyed perception with time being 5D as objective reality. Thus, based on the time dilation equation, if one multiplies $\Delta t_0 \sqrt{1-v^2c^2}$ on one side of the equation (as to add one more layer of dimension in the equation in relativity), one, as a result, concludes that time dilation results as another format of relativity operating under 5D. Therefore, based on our objective reality, time is 5D; equation is therefore set up as:

$$\Delta t = \frac{\Delta t_0}{\sqrt{1-\frac{v^2}{c^2}}} \times \frac{\Delta t_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$\Delta t = \frac{{\Delta t_0}^2}{1-\frac{v^2}{c^2}}$$

Thus, according to Bayes Theorem in which $P(A \mid B) = P(B \mid A) \times P(A)P(B)$ where:

P(A | B) = Probability of A given B is true
P(B | A) = Probability of B given A is true
P(A) = Probability of A being true as given knowledge
P(B) = probability of B being true as given knowledge
... it can be concluded that figure 3. Is provable by having:
P(A | B) = Δt = stationary time
P(B | A) = $\Delta t_0 \sqrt{1-v^2c^2}$ = proper time or relative time
P(A) = Δt_0 = proper time or one position time
P(B) = $\sqrt{1-v^2c^2}$ = relativity rate or effects

Thus, by the logic of Bayes theorem applied to the new relativity equation as in 5th-dimensional time relativity, one can consequently come to a conclusion that if one expands our consciousness into objective reality, time is relative with additional layers on top of original time dilation equation with more conditions that bottom of the fraction shall not become 0 (and with a rule to stay positive rather than negative) along with another of having the top of fraction not becoming negative. If the math is done right in the new equation, one can realize that the new equation tends to have more dilated or slower relative time compared to the original dilation equation. Thus, 5D time relativity flows slower.

Judging by how the numbers of eyes lead to objective reality, at the end of the day, it is our mind's work to perceive and organize such objective reality. Thus, just like Einstein had said about sitting in front of a pretty girl or sitting in front of a hot stove, our time in our mindsets tends to slow down more than the original time dilation equation as those conscious relativity operates under a 5-dimensional spectrum. If one set v = 0.950c with Δt_0 as in 1.52s with μ=muon value to figure out Δt, one can easily realize new time

dilation equation flows slower or what it is seems to be slower as new squared time relative effects (Urone and Dirks, 2012); relativity rate tends to be higher than original Einstein's equation which divides the proper time to have time slow down. In other words, proportionally, original time dilation and new time dilation equation are same in character with proportionally different illusions stretching the dilation further in amplified dimensional perspective, which is why Einstein's equation worked as it was only a minimized version of the objective reality of time.

Hence, conscious relativity must be written with the following equation: such conscious relativity hypothetically will obey the equation of:

$$\cdot \frac{P^A}{B} = \beta$$

with P being numbers of subject perceptions, A as in individual's number that is perceiving P, B as in "common knowledge mean rate" (which means knowledge that is known by one another as a public with the awareness that each of those people knows that knowledge altogether), and β being the "shared knowledge mean rate" (which is different from common knowledge as it does not imply that everyone is aware that every one another are aware of knowing the same 3-dimensional idea or object—only two know that one another knows of an idea) (Reuell, 2015). Reuell (2015) states the definition of common knowledge and shared knowledge in his paper; and, this paper only borrowed his concept to make the equation. Conscious relativity theory, therefore, argues relativity between two interactive common knowledge and shared knowledge accordingly by the value of subject perception and the outside numbers of individuals perceiving it. To sum up, metaphorically, common knowledge is based upon the idea of two eyes perceiving reality while shared knowledge is one-eyed perception. To elaborate, common knowledge is a representation of the capability for us to view reality quite literally in 3D with 4D biology. Just as Reuell (2015) states, those who have common knowledge to cooperate within experimental game only did so because more people knew what one another knew. To apply this to the equation the more shared knowledge grows the more it represents conscious relativity between two consciousness within self. This will, therefore, create asynchrony rather than unite in any reality—from mind-body therapy to simulation world, any reality is applicable with 4^{th}-dimensional axis. Thus, the literal portrayal of reality is a web of common knowledge in public while shared knowledge is defined as the actual relativity effect of having 3D cooperating to it (Berg and Brenner, 1994). In other words, three or more people with common knowledge represent two eyes for those two people, while two people who have shared knowledge or belief are represented as one eyed.

Theoretically, conscious relativity would lead us to understand the perception of reality better. Suppose a shared knowledge becomes amplified; common knowledge will have to reduce in average mean rate while perceptions among the individuals are adding up to enhance shared knowledge. Such shared knowledge or relativity effect would indicate less friction in mindset among the public, as one would not stress about synchronizing and checking the facts. To elaborate, if one swaps common knowledge as common memory and shared knowledge as shared memory, things tend to gear into something more interesting. If one perceives memory with an exponential increase in numbers of individuals with bigger common memory mean rate where everyone is aware that others are also aware of the same memory, shared memory tends to shrink making memory connected to become the new laws of physics. Sociologically and psychologically, therefore, rumors tend to make victims act susceptible accordingly to their tales as the majority's opinion of that victim bends victims' nature. This very theory is based on conscious relativity influencing the lower dimension of 3D space where height, width, and depth in 3D are bent by conscious relativity equation where even behaviors are visualized and tuned by 3D axes.

Thus, smaller the relativity effect, the more united public becomes as cooperation is statistically highest when common knowledge is at peak based on experiment from Reuell (2015) paper. And as Berg and Brenner (1994) states, two eyes and one eye differ in capability to read depth. In other words, those with two eyes will experience as I have hypothesized as a premise mentioned before in reality distortion while one eye people will have a slowed down or resisted susceptibility to conscious manipulation because spatial reality in 3D depth is distorted itself in the 3-dimensional space, hypothetically. Unlike of what Berg and Brenner (1994) imply, therefore, it can be inferred that to have depth perception, two eyes are needed as eyes perceive space perpendicular to conscious axis where it kills the conventional science of space being perpendicular to time. Time is therefore not a key axis as time rather flows through us which will be discussed later; and, as a side note, light is a premise to have conscious axis functioning.

As a counterargument to prove my theory furthermore, Burt and Crewther (2020) define the perception of the face as a 4-dimensional space and time where the 4th axis being time is reflected in perceiving the face in the simulation world. The author proposes time axis in shaping face in simulation is what helps the engineers to determine and quantify emotions, personality, and other complex cognitive characteristics. However, such allegations can be swapped with the conscious axis for the 4th axis that was alleged as time by the authors. Time and consciousness are not equal. Although light bouncing off from conscious perception is the premise for my theory, time is not suitable as time governs consciousness and therefore should be placed in a higher dimension apart from the conscious axis being the 4^{th}-dimensional axis. If time exists, it only exists because one is conscious. And the conscious axis aids in making time perceivable for us to feel it. Time itself is governed by gravity; hence their results of having emotions, personality, etc. quantified are based on illusory conceptions of misplacements in engineering in the simulation world. A value for axis in 4^{th}-dimension does exist. However, to frame this as time is not what makes simulation express cognitive characteristics in machine learning. Time and conscious axes are both separate axes. But, they are similar in a sense that one perceives time because one is conscious and vice versa, which is a proof that counter-interactive axes share some characteristics which may have allowed science community to only put time as a 4^{th} axis in 4D. To visualize dimensions, time and consciousness can result in similar effects as they both mirror one another in reality. Besides, the chain reaction of dimensions, the gravity on Earth is what makes us perceive time in linear direction based upon gravitational time dilation which will be discussed later again in this paper (Baird, 2013). To look into this deeper, reality is shaped by consciousness rather than time; this is why time is misrepresented as the true 4^{th} axis in the 4^{th}-dimension (Burt and Crewther, 2020). However, as it had been mentioned, time and conscious axes are similar.

Thus, unlike what Settembre (2020) states in her published essay within medium.com, the original fourth dimension, with time being the fourth axis, shall hypothetically be swapped with the consciousness of space—according to the theory. As a result, the fourth dimensions become our spatial reality, with the time axis being added to the fifth dimension (and the 6th-dimensional axis being gravity), where the idea of people sensing time in one direction is based on this theory. With additional consciousness and time axis in the 5th dimension, while three axes in 3D are represented in height, width, and depth, it would be necessary to test this theory right at this moment by suggesting readers "to close their eyes." What you perceive is darkness with no 3D but a conscious axis and time axis in the 2D state, which proves our senses are hardwired to conscious relativity that dilates in time even without 3D space. The dark plane, as you close your eyes, cannot exist without 2 axes, and therefore time itself should not be the only factor that dictates the space of the void; it is a proof that another axis exists to represent darkness in a 2

dimensional plane which is the conscious axis, theoretically. To extend from what had been said earlier, Schmid (2021) states, even when people close eyes some light comes through eyelids and, thus, proves conscious axis requires light to have it functioning.

This phenomenon happens because one is shackled by perceiving time in one direction as time is dictated by gravity through gravitational time dilation theory—a theory that explains time goes faster as one escape from the gravity of Earth, as one drifts off to the cosmos (Baird, 2013). In short, time becomes one of two axes or "linearity" to represent the dark void as a 2-dimensional space. To explain why time is felt in linearity based on gravitational time dilation, I will discuss it further in the Discussion section.

Our evolution of consciousness allows us to go back in time through memory systems in our brains. The main reason why one cannot reverse the time itself is because our perception or consciousness already suffices that traits in 4D space of reversing time by having memories in the brains where one can remember the past based on conscious relativity theory, hypothetically and empirically speaking based on observation on reality; apart from it, hypothetically, gravity is, therefore, a 6^{th}-dimensional axis for 6D space. It is important to note that the objective reality that I am suggesting only applies to humans as time may be perceived differently by other animals or even bacteria.

Time and space are known to be perpendicular. However, with this new theory, relativity flows just like original Einstein's time relativity theory, where time in 5D is dilated even more according to my new equations. Thus, in other words, consciousness and space axes are perpendiculars which is slightly different from space and time being perpendicular. To elaborate, time flows as space fills the void, hence, space-and-time perpendicular relationship. Conscious axis exist backwards of the flow where time has surpassed the space. In fact, to hypothesize, conscious axis may overlap in time if 3D space is a planar with axis of time shooting out as a perpendicular with conscious axis stretching from previous and after the planar space piercing through space reality. In other words, time stretches from past to future in one direction, whereas, conscious axis diverge in two paths from the space to go perpendicular in both past and future with space being the starting point for two vector pathways. The main reason of why conscious could remember past is based upon this. An idea that uses conscious relativity theory to rewire our biology in 3D space by dilating aging based upon proper memory and stationary memory in the previous equation, will be mentioned in the Discussion section for medical uses to rewind the health back to the younger self by using consciousness into our advantage, hypothetically.

Hence, for the 6^{th} dimension, the 6^{th} axis shall be the gravity axis where it regulates time just like time governs consciousness based on how one is trapped in one direction of time but also freed by going into the past through memories (as one example of manipulating time while being enslaved by time). This theory is based on the idea that if one gets near the black hole, time slows down which proves gravity is superior to time. To support further, time is perceived in one direction based on gravity on Earth as the theory of gravitational time dilation explains time goes faster the further you are away from Earth (Baird, 2013). In other words, for speed to go faster, time speeding up equalizes with the speed formula to reach light speed as distance increases in numerator while time shortens in denominator (as time speeds up). For a life to reach light speed, it would mean a person not aging at all or frozen in time (Taylor, 2021). Hence, without the warping of space and time in cosmos, one will reach light speed automatically. Therefore, it can be concluded gravity bond us to feel time in a linear way which makes us age as time flows through us by gravity on Earth. If one reaches light speed one will not be bound by time, making us immortal under the condition that no planetary system holds us within their gravity in the cosmos, when we drift to space, away from Earth.

To be specific, gravity is merely an effect of warping in space and time according to the conventional knowledge in physics (How We Know Gravity is Not (Just) a Force, n.d.). However, such an allegation may prove itself wrong as time may not be the only axis that is perceivable to us. As far as anyone knows, as Gefter (2009) states, electromagnetic and nuclear forces are trapped in the 4^{th} dimension, and gravity leaks out to the fifth axis in the 5^{th} dimension. Therefore, dimensions of hyperspace are a by-product of an attempt to weave realities based on mathematical empiricism to make the universe more sense to us. However, such conventional theory in physics is quite inaccurate. Take 'Oumuamua as an example. As the article of 'Oumuamua (2019) states, the meteor or 'Oumuamua "slingshot" through our solar system as if gravity was not influential against it. With its immense speed of passing through our solar system, one can, thus, hypothesize there is one other axis that such meteor followed regardless of time and space warping gravity: conscious axis may be the reason why such comet passed without influence from our solar system's gravity. If this comet was meant to be an "alien" ship or otherwise, it would explain somehow that the conscious axis is part of the phenomenon of "slingshot" through our solar system. To make such conscious axis to prevail in physical world to our naked eyes is yet to be known.

Discussion and Conclusion:

As to apply this to real-world problems, just as I had mentioned earlier to explain how this new dilation may apply to medical fields, would the enhanced dilation equation dilate brain aging for extended life expectancy in medical terms? Theoretically and literally, Einstein proved time relativity as the standard of physics term of "time." However, this conscious relativity tends to go beyond just simply defining relativity in time; it defines how our brain ages like a time machine in perceptions to make it be prolonged through constant flashbacks of memories. In the old proverbs, it is said living in the past only makes us static. However, rather than going through the future, if one's purpose is to live and think young, thinking in a younger self-perspective tends to bring our biology to replicate that younger self which is why the time and consciousness axis tend to tune our biological characteristics "within" spatial 3-dimensional axes and "within" the perceived past—hence, reflecting on past memories tend to lead our physical body to replicate its past health biologically in 3D of height, width, and depth, hypothetically speaking. Mind-body therapy is one example for such theory. To think of relaxing memories, Astin (2004) states our body can relieve pain as a substitution for the pain killing drugs. Thus, thinking of happy memories can theoretically relieve the stress in mind and beyond to the body itself. Therefore,

$PAB = \beta$
can be rewritten as
$PA = B$
with = shared knowledge & memory or relativity effect

P = proper perception
A = exponential growth of individuals perceiving oneself in the past memories as one being healthy youth
B = the common knowledge mean rate (its numerical increase is represented as health growing healthier–the bigger the numerical value in B, the healthier one becomes). Thus, the mind will be directed to become healthier as common knowledge is equal to concurrent individuals noticing your health being restored. The more rumors spread of your improved health the more you become confident in your health to become even healthier–hence mind-body therapy is based upon this (Astin, 2004). In figure 5., common knowledge may seem to deteriorate health, however, as Astin states, that is where mind-body therapy begins by starting from relieving pain by just relaxing and meditating or in my theoretical case, thinking of memories of healthy youth.

Therefore, it shall be concluded that time relativity which Einstein came up with proves it is right even in our reality but wrong in every objective perception. As people tend to perceive the world as a 3-dimensional space, it works even on the tools or technologies that are built on top of time relativity theory. Hypothetically speaking, information only exists in our matrix, only if life perceives it. Therefore, information tends to comply to the time relativity of Einstein's as majority perceive it so. However, if one expands further into conscious relativity to understand our minds, it will prove that our reality is 4 dimensions by thinking outside the box. This information will be accepted with fully functioning mechanisms as long as this new perception is accepted by the majority, just as everyone accepted Einstein's time relativity theory.

References

Alok Jha. (2014). E=mc2: Einstein's equation that gave birth to the atom bomb. *The Guardian*. https://www.theguardian.com/science/2014/apr/05/einstein-equation-emc2-special-relativity-alok-jha

Amanda Gefter. (2009). Beyond space and time: 5D – Into the unseen. *NewScientist*. https://www.newscientist.com/article/mg20327231-900-beyond-space-and-time-5d-into-the-unseen/

Amelia Settembre. (2020, May 3). What Is The Fifth Dimension, And Where Did It Come From?. Medium. https://medium.com/swlh/what-is-the-fifth-dimension-and-where-did-it-come-from-1296487fafcf

Ashley P. Taylor. (2021). What would happen if the speed of light were much lower? Live Science. Life's Little Mysteries. https://www.livescience.com/what-if-speed-of-light-slowed-down

Astin J. A. (2004). Mind-body therapies for the management of pain. *The Clinical journal of pain*, *20*(1), 27–32. https://doi.org/10.1097/00002508-200401000-00006

Buhusi, C. V., & Meck, W. H. (2009). Relativity theory and time perception: single or multiple clocks?. *PloS one*, *4*(7), e6268. https://doi.org/10.1371/journal.pone.0006268

Burt, A. L., & Crewther, D. P. (2020). The 4D Space-Time Dimensions of Facial Perception. *Frontiers in psychology*, *11*, 1842. https://doi.org/10.3389/fpsyg.2020.01842

Christopher S. Baird. (2013). Does time go faster at the top of a building compared to the bottom? *Science Questions with Surprising Answers*. https://www.wtamu.edu/~cbaird/sq/2013/06/24/does-time-go-faster-at-the-top-of-a-building-compared-to-the-bottom/

"How We Know Gravity is Not (Just) a Force." (n.d.). *Universe Today Space and Astronomy News*. Retrieved from https://www.universetoday.com/108740/how-we-know-gravity-is-not-just-a-force/

Jill Baron. (2002, Pg. XXVII). Rocky Mountain Futures: An Ecological Perspective. *Washington, DC: Island Press*. https://www.barrypopik.com/index.php/new_york_city/entry/those_who_have_the_privilege_to_know

Katrina Schmid. (2021). Why do we see different colours when we close our eyes? — Anais, aged 7. *The Conversation*. https://theconversation.com/curious-kids-why-do-we-see-different-colours-when-we-close-our-eyes-154378#:~:text=Some%20light%20does%20go%20through,our%20eyes%20in%20the%20dark.

"Oumuamua." (2019). *NASA Science Solar System Exploration*. https://solarsystem.nasa.gov/asteroids-comets-and-meteors/comets/oumuamua/in-depth/

Peter Reuell. (2015). Understanding Common Knowledge. *The Harvard Gazette*. https://news.harvard.edu/gazette/story/2015/03/understanding-common-knowledge/

Urone and Dirks. (2012). *College Physics*. (iBooks ed.). Openstax. https://courses.lumenlearning.com/physics/chapter/28-2-simultaneity-and-time-dilation/

van den Berg, A. V., & Brenner, E. (1994). Why two eyes are better than one for judgements of heading. *Nature*, *371*(6499), 700–702. https://doi.org/10.1038/371700a0

Evaluating the Therapeutic Effects of Psychedelic Therapies and Their Proposed Mechanisms

Antonio Pelaez

New York University

Introduction

From the ancient Greeks to the ancient Indians, the use of classic psychedelics as sacraments is well documented throughout history. Yet, scientific interest in this class of drugs did not begin until the accidental discovery of the synthetic compound lysergic acid diethylamide (LSD) by Albert Hofmann in 1938 (Johnson et al., 2019). During the 1950s and 60s classic psychedelics were of great interest in the field of psychiatry, the emerging field of molecular neuroscience, as well as the study of the neurotransmitter, serotonin. Psychedelics were particularly interesting to the study of serotonin because this class of drugs act as an agonists for the 5-HT_{2A} receptor subgroup in the brain (Carhart-Harris, 2018). This is a receptor that is part of a larger family (5-HT_{1-7}) that is modulated by serotonin. Psychedelics also began to emerge as a useful tool for studying the biological bases of psychological disorders. Studies then had already begun to establish the benefits of psychedelics for end-of-life psychological distress, as in patients with terminal diagnoses for example, and alcohol and cigarette addiction (Johnson et al., 2019).

Then, in the early 1970s, the recreational use of psychedelics became popular and heavily associated with the counterculture movement. As a result, the United States passed the Controlled Substances Act which halted funding from the National Institute of Mental Health (NIMH) for the research of the therapeutic potential of psychedelic drugs. In addition , approval from the Drug Enforcement Agency (DEA) to obtain even small amounts of the drugs became nearly impossible to obtain. Fortunately, by the nineties, the US governmental attitudes moved away from those of the War on Drugs era, and the Federal Drug Administration (FDA) slowly began approving more studies involving psychedelics. From that point on, classical psychedelics have slowly begun to reemerge as an exciting field of study.

Grinspoon and Bakalar (1979) describe a classic psychedelic as "a drug which, without causing physical addiction, craving, major physiological disturbances, delirium, disorientation, or amnesia, more or less reliably produces thought, mood, and perceptual changes otherwise rarely experienced except in dreams, contemplative and religious exaltation, flashes of vivid involuntary memory, and acute psychosis" (Grinspoon and Bakalar, 1979 as cited in Johnson et al., 2019). The different mental states that classic psychedelics induce while lacking the usual negative drug-induced side effects are interesting to the fields of neuroscientific and psychological research.

Psychedelics have been previously referred to as "hallucinogens", but the term was deemed unfit as it wrongfully conveyed the idea that the drugs induced true hallucinations and failed to incorporate a description of the radical effects of the drugs on human consciousness and sense of self. Instead, the term "psychedelic", which roughly means "mind-manifesting", was coined by Humphrey Osmond (Aldous Huxley's interlocutor, psychiatrist and psychedelic research pioneer) in 1957 (Johnson et al., 2019; Carhart-Harris, 2018). Research by Carhart-Harris et al. (2018) has proved this term to be more correct as this class of drugs causes a more free form sense of consciousness, much less centered on one's conventional sense of self (Carhart-Harris et al., 2018).

Classic psychedelics can be grouped into one of two structure categories, those with variations in structure of *tryptamine* (e.g. LSD, psilocybin, and dimethyltryptamine (DMT)) or those with variations on the structure of *phenethylamine* (e.g. mescaline) (Johnson et al., 2019). Tryptamines are molecules that have a similar chemical structure as serotonin and bind with serotonergic 5-HT_{2A} receptors in the brain. Phenethylamines act as stimulants to the central nervous system, increasing heart rate and energy, and often have psychedelic effects as well (Nichols, 2012). For this reason, other drugs in this category, such as MDMA are often associated with rave and party scenes.

Therapeutic Uses

The therapeutic properties of psychedelics have been harnessed into focused psychotherapies which have been used to reliably decrease anxiety and depression and improve general life outlook in patients with terminal diagnoses. One example is the treatment of psychological distress related to a terminal diagnosis of cancer (Rosenbaum, 2019). In these sessions, psychedelic psychotherapy first involves preparation and relationship building with facilitators before administration of the psychedelic drug. This is done so as to facilitate a more comfortable experience for the patient. Also, during the trial, comforting physical and interpersonal environments (e.g. eyeshades to block visual stimuli, carefully selected music typically personal to the patient, and follow up discussions debriefing the patients' experience) are common. In these trials, both psilocybin and LSD have reliably shown a trend of decreasing depression (measured on the Beck Depression Inventory) and anxiety (measured by the State-Trait Anxiety Inventory) symptoms as compared to placebo. Importantly, these scores remained consistent in later follow up sessions up to 6 months later (Johnson et al., 2019), demonstrating the longevity of the effects, particularly as compared with Selective Serotonin Reuptake Inhibitors (SSRIs), the current most widely used medication for Major Depressive Disorder.

Recently, Carhart-Harris et al. (2017) published the results of a trial with 12 patients with moderate to severe treatment resistant major depression. In this trial, subjects received two doses of oral psilocybin (10mg and 25mg, 7 days apart) the isolated psychoactive compound present in hallucinogenic mushrooms. Depressive symptoms were assessed on the Quick Inventory of Depressive Symptoms (QIDS) 1 week and also 3 months after treatment. Depression scores were once again significantly lower both at 1 week and 3 months post treatment (Carhart-Harris, 2017). Interestingly, in treating patients with depression, greater ratios of "mystical experience" significantly correlated with lower depression scores five weeks post treatment. "Mystical experience" can be defined briefly as a self reported sense of unity. Through fMRI imaging, this same study found increased connectivity within regions of the brain known as the default mode network (DMN) and between the para-hippocampal cortex and prefrontal cortices produced as a result of the psilocybin treatment one day after the session were predictive of the patient's clinical response five weeks post treatment. Though it is a wide ranging network, the DMN is primarily composed of the medial prefrontal cortex and posterior cingulate cortex and is usually active when a person is not focused on the outside world and is in a state of "wakeful rest". fMRI scans in the same study also showed decreased amygdala response one day after psilocybin treatment. This is significant because decreased blood flow to the amygdala was shown to correlate with reductions in depressive mood. The opposite was found to be true in previous research with SSRI treatments of depression, currently the most common class of medications for depression. (Carhart-Harris et al., 2018; Roseman et al, 2017 cited in Johnson et al., 2019). The positive effects of these therapeutic sessions with psilocybin are usually long lasting. In fact, ratings of positive behavior, mood, and attitude 14 months after psilocybin sessions were equally as low as those provided 2 months post session (Johnson et al., 2019).

Psychedelic therapies have also been used to treat addiction. Studies of smoking cessation treatment have shown that psilocybin administered over the course of 8 weeks along with cognitive behavioral therapy is more effective (80% of participants quit after 6 months) than the typical medication and/or behavioral smoking cessation therapies (<35% of participants quit after 6 months). Similar studies with alcohol addiction have demonstrated the same effect (Johnson et al., 2019).

Further, classic psychedelics' therapeutic properties can be extended to include anti-inflammatory effects. This is significant because diseases related to inflammation including coronary artery disease, diabetes, asthma, inflammatory bowel disease, and rheumatoid arthritis are amongst the leading causes of death or reduced quality of life around the world (Nichols et al., 2017). Further, inflammation in the brain is closely related to several psychiatric disorders including depression and addiction as well as neurodegenerative diseases such as Parkinson's and Alzheimer's disease (Hong et al., 2016 cited in Nichols et al., 2017).

Psychedelic drugs have anti-inflammatory properties that have been proposed to arise through the activation of the serotonin 5-HT_{2A} receptor (Nichols et al., 2017). Research by Yu et al. (2008) hypothesizes that the 5-HT_{2A} receptor activated through psychedelic use initiates anti-inflammatory signaling cascades that directly interfere with communication between activated master inflammatory cytokine tumor necrosis factor alpha's (TNF-α) downstream effectors like nuclear factor kappa B (NFκB). A model for this is depicted (Figure 1) below (Yu et al., 2008).

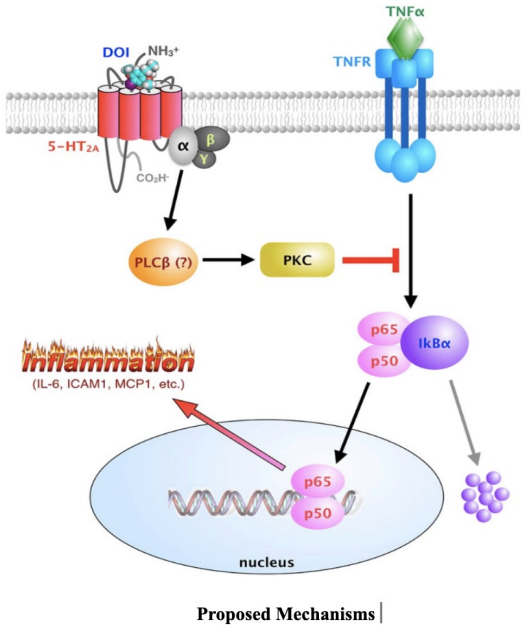

Figure 1: Proposed Mechanisms

DMN Reorganization

The brain is organized into many layers of complex systems often adhering to specific modular functions, like representing motion or line orientation, for example. These systems are sometimes referred to as resting state networks (RSNs) (Nichols et al., 2017). RSNs eventually integrate their respective information between nodes for efficient communication between modules that are responsible for complex processing (e.g. hand-eye coordination). Communication between these systems is normally organized into stable networks in the brain (Yeo et al., cited in Johnson et al., 2019). These connections are unique from person to person and consistent enough within an individual to be able to separate scans from the same individual through what is called "connectome fingerprinting" with very high accuracy (99% accuracy or greater). The most easily discernible areas between individuals are typically in those higher order brain regions involved in self-referential processing and attention. This suggests that differences in these regions constitute an individual's own "neural identity" (Petri et al., 2014). Classical psychedelics have been shown to have the effect of decreasing activity and

correlation within and between the particular established networks responsible for self-referential processing (regions of the DMN such as the posterior cingulate cortex). It is hypothesized that during these acute drug effects, the brain has the opportunity to reorganize into new networks providing the chance for long lasting behavioral changes (Carhart-Harris et al., 2018).

The DMN consists of the posterior cingulate cortex (PCC), medial prefrontal cortex (mPFC), and lateral parietal cortex (LPC). The PCC is responsible for internally directed cognition, the mPFC for rumination, autobiographical memory recall, self-related judgements and theory of mind processes, and the LPC is implicated in a number of processes including empathy. Impaired connectivity between these regions to non-DMN regions in depressed patients has been associated with greater disorder severity. High connectivity among regions of DMN coupled with low connectivity between DMN and executive networks has also been implied in the pathophysiology of Major Depressive Disorder (Leibenluft and Pine, 2013 cited in Johnson et al., 2019). This evidence points to a strong link between DMN and frontal cortex function and clinical depression. It has been proposed that the decrease of activity and connectivity in DMN and frontal brain regions by classic psychedelics opens the door to disruptions to the typical organization of the brain in waking consciousness in these systems. This can help individuals to experience new thinking patterns and might explain psychedelics long lasting positive effects in treating depression. These findings are supported by the fact that increased activity and connectivity within the DMN has been consistently shown in individuals with depression (Carhart-Harris et al., 2018).

Stam (2014) expanded on this idea further proposing the hypothesis that disruption of the typical functioning of these networks is potentially a common pathway among several neurological and psychiatric diseases beyond major depressive disorder such as bipolar disorder (bipolar 1 and 2), generalized anxiety disorder, and addiction (Stam, 2014 cited in Nichols et al., 2017). Since addiction is now understood to relate to the disruption of balance between the reward system of the limbic layers and top-down cortical control, it could be surmised that an underactive DMN with less than typical connectivity might be the cause of addictive behaviors (Johnson et al., 2019). This is evidenced by findings which suggest that DMN and executive network connectivity is decreased in chronic cocaine, nicotine, and heroin users. Reductions in the craving and withdrawal symptoms common to addiction are hypothesized to result from the solidification of new and abnormal connectivity patterns induced by psychedelic drugs (Cole et al., 2010).

Entropy

The entropic brain hypothesis posits that the "quality" or "richness" of a conscious state can be measured by indexing a particular parameter of spontaneous brain activity such as oscillations in electrical brain potentials measured through EEG (Carhart-Harris et al., 2018). The hypothesis holds that higher entropy leads to greater uncertainty about the behavior of the neural system and its informational content. Further observations of psilocybin and LSD use note the increase of brain entropy as a potential mechanism for the altered states of consciousness they produce. Previously, it was believed that waking state consciousness demonstrated the highest level of entropy, since all other states characterized by lower consciousness were seen to have lower entropy. The discovery that psychedelics further pushed the bounds of entropy was, therefore, revolutionary.

Psychedelics lead to a brain state with greater connectivity, which forms and fragments over time. It should be said that increased entropy does not just make the brain connectivity more random, but also establishes more long range connections (Figure 2b) that are not present in the normal state of consciousness (Figure 2a), as

depicted below. Importantly, the brain still retains some organizational features. The new connections are proposed to have the effect of disrupting connections responsible for psychiatric disorders. Then, these networks have the opportunity to reconnect in healthier ways with the absence of the pathological driving forces which led to disease in the first place (Petri et al., 2014).

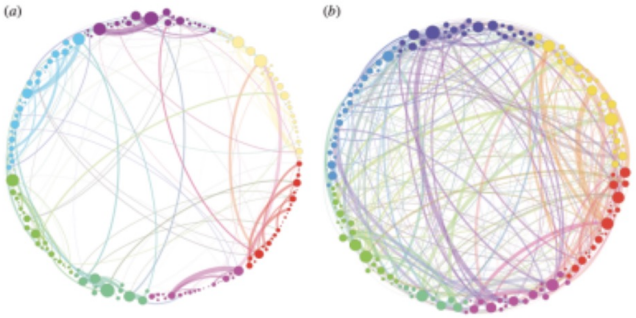

Figure 2

Carhart-Harris (2018) found the greater the increase in entropy the higher the subjective intensity of the experience of the drug was for each patient. The magnitude of fMRI-measured brain entropy while under the influence of LSD was a valid metric for predicting changes in personality two weeks later. An enhancement of brain criticality was also observed under LSD relative to normal waking state. The critical brain hypothesis implies that there is a critical point in the brain between order and disorder after which certain phenomena such as power-law scaling appear so as to increase efficiency while retaining order. This hypothesis has been used to explain the increased connectivity of the brain in the psychedelic state while still maintaining important organizational features. More generally, entropy measures were found to be accurate distinguishers of mental state (e.g. waking consciousness compared to anesthetized state compared to disorders of consciousness) (Carhart-Harris, 2018).

Similar to entropy, increased criticality in the brain is virtually unheard of other than in seizures (Carhart-Harris, 2018). An observed increase in criticality as a result of psychedelic drugs is, therefore, just as equally as noteworthy. This increased criticality has the effect of maximizing capacity and efficiency of information processing by making the brain more adaptable while still maintaining order (Shew and Plenz, 2013 cited in Carhart-Harris, 2018). Essentially, an increase in criticality favors flexibility and susceptibility to perturbation over preservation.

Carhart-Harris proposes that the value non-specific encoding of surprise by serotonergic neurons in the dorsal raphe nuclei is effectively synonymous with entropy. One interpretation of this is that the neurotransmitter serotonin works to break down prior assumptions allowing for new learning when environmental conditions are so volatile that heightened flexibility and exploration are most advantageous (Carhart-Harris, 2018). This contributes to the therapeutic effects of classic psychedelics.

Blood Flow

Carhart-Harris et al. (2011) demonstrated a significant decrease in cerebral blood flow (CBF) in subcortical (bilateral thalamus, putamen, and hypothalamus) and cortical regions (PCC, retrosplenial correct, precuneus, rostral and dorsal anterior cingulate cortex (ACC), and mPFC). These decreases were most pronounced in high level association regions (PCC and mPFC) as well as crucial connector hubs such as thalamus, PCC, and ACC. When plotted against subject ratings of drug effect intensity, researchers found that the greater the decrease in CBF, the more intense the subjective experience of the drug was. Similar findings to CBF decreases were seen in blood oxygen level dependent (BOLD) fMRI with consistent decreases in mPFC, putamen, and subthalamic nuclei. Interestingly, the researchers noted that the regions of the brain which had the most consistent deactivations after psilocybin were the same as those that show abnormally high activity under normal conditions. For example, the PCC shows 20% higher metabolism rates than other brain regions yet psilocybin decreased blood flow in this brain region by up to 20% in some subjects. The PCC like other aforementioned

areas of interest is believed to play a functional role in the DMN which is altered by the introduction of psychedelic drugs. Further, the mPFC which has been observed to have higher activation in individuals with clinical depression was shown to be consistently deactivated by psilocybin providing a potential explanation of some of the positive effects of this class of drugs in treating depression (Carhart-Harris et al., 2011).

5-HT_{2A} Receptor

Serotonin primarily mediates behaviors including aggression, mating, feeding and sleep through interactions at seven different receptor families (5-HT_{1-7}) comprising 14 subtypes (Nichols and Nichols, 2008 cited in Yu et al., 2008). All of these are G protein coupled receptors (GPCRs) except for the 5-HT_3 receptor which is a ligand gated ion channel. Generally, the 5-HT_{2A} receptor is the most widely expressed serotonin receptor in the mammalian body. This receptor is expressed at the highest densities in the brain and is known to couple to Gαq effector pathways. It is present in nearly every tissue and cell type examined, and is most notably present in all major types of immune related cells. The 5-HT receptor has been closely linked with complex behaviors. Studies of this receptor's role outside of the CNS have shown its importance in cell differentiation and proliferation, vasoconstriction and immune regulation (Nichols et al., 2017).

Particularly high densities of this receptor are expressed in the claustrum of the brain. The claustrum is a cluster of neurons and glial cells. It has connections to the cortical and subcortical regions, is located between the insula and putamen, and is shaped in a thin structure. Research has shown this area to be connected to many parts of the brain, expressing the highest density of connections of all brain regions examined (Torgerson et al., cited in Nichols et al., 2017). This leads researchers to hypothesize the claustrum to be implicated as a primary contributor to the overall architecture of the brain making it something like a "gatekeeper" of neural information for conscious awareness.

The effects of classic psychedelics depend heavily on 5-HT_{2A} receptors, proven by the finding that 5-HT_{2A} antagonists block researchers' ability to distinguish between resting state and the psychedelic state (Glennon et al., 1983 as cited in Johnson et al., 2019).

Martin and Nichols (2016) found the nature of how psychedelics affect these widely expressed receptors to be contingent on the location of the brain region where they are expressed. Receptors in different regions responded differently. Martin and Nichols (2016) hypothesized the presence of a small "trigger population" of neurons expressing the 5-HT_{2A} receptor that initiate the events at the cell level which eventually lead to the cortical network destabilization and other perceptual and cognitive behavioral effects associated with psychedelics (Martin and Nichols, 2016).

Nau et al., 2013 were able to show the therapeutic and anti-inflammatory effects of the 5-HT_{2A} agonist 2,5-Dimethoxy-4-iodoamphetamine (R-DOI) in treating asthma-like conditions in rats. In this animal model, mice treated with R-DOI before inhaling ovalbumin (OVA), an agent known to induce allergic asthma in mice exhibited very little peribronchial inflammation or mucus (typically markers for asthma) afterwards. IL-5 and GM-CSF are both molecules which are important to the development of asthma and were both shown to be suppressed by R-DOI. Eosinophils, which are responsible for bronchoconstriction and destruction to airways, were also blocked by R-DOI treatment (Nau et al., 2013). These findings add to the literature of the benefits of agonists to the 5-HT_{2A} receptor most commonly affected through the use of psychedelic drugs.

Similarly, Yu et al., 2008 were able to prove that very low concentrations R-DOI super potently inhibit TNF-α induced expression of pro inflammatory genes ICAM-1, VCAM-1 and IL-6 in primary aortic smooth muscle cells of rats in. Activation of these receptors demonstrated an anti-inflammatory effect ~300 times more potent

than any current anti-inflammatory agent. Importantly, these anti-inflammatory effects were noted when R-DOI was used as a pre- and co treatment as well as when it was added many hours after TNF-α treatment. This suggests therapies could be aimed not only as preventative measures but also as treatment for inflammation or injury that has recently occurred or is ongoing. As a whole, these two findings present 5-HT_{2A} agonists, such as classic psychedelics, as potential therapeutics for the various diseases believed to be caused by inflammation mentioned previously (Yu et al., 2008).

Four Factors in the Mystical Experience Questionnaire (MEQ30)

Factor 1: Mystical

Internal Unity

Experience of pure being and pure awareness (beyond the world of sense impressions).

External Unity

Experience of oneness or unity with objects and/or persons perceived in your surroundings.

Noetic Quality

Certainty of encounter with ultimate reality (in the sense of being able to "know" and "see" what is really real at some point during your experience.

Sacredness

Sense of being at a spiritual height.

Factor 2: Positive Mood

Experience of amazement.

Factor 3: Transcendence of Time and Space

Loss of your usual sense of time or space.

Factor 4: Ineffability

Sense that the experience cannot be described adequately in words.

The MEQ30 is a psychometrically validated retrospective measure of acute mystical experience (MacLean et al. 2012; Barrett et al. 2015). The four factors of the questionnaire are derived from a total of 30 items that probe seven dimensions (designated by underlines) of mystical experience that were identified by Stace (1960b). The Mystical factor is composed of 15 items probing four dimensions of the Stace model (internal unity, external unity, noetic quality, and sacredness). Positive Mood (6 items), Transcendence of Time and Space (6 items) and Ineffability (3 items) factors correspond to three separate dimensions of the Stace model. The psychometrically validated MEQ30 consists of a subset of items from the older MEQ43. Illustrative items are shown in italics. [Adapted from Barrett and Griffiths (2018)]

Figure 3

Mystical Experience

According to Stace (1960), "mystical experiences refer to a class of experiences having a primary feature of a sense of unity of all people and things accompanied by a sense of reverence and the authoritative truth value of the experience. Other dimensions include sacredness – a sense that what is encountered is holy or sacred; noetic quality – the experience is imbued with an aspect of meaning and a sense of encountering ultimate reality that is more real than usual everyday reality; positive mood – joy, ecstasy, blessedness, peace, tenderness, gentleness, tranquility, awe; transcendence of time and space – notions of time and space have no meaning during the experience; and ineffability – the experience is difficult to put into words" (Stace, 1960 as cited in Johnson et al., 2019). Yet, despite the fact that it is clear they are important to the psychedelic experience, the unpredictability and low probability of "naturally occurring" mystical experiences has made them remarkably hard to study in the controlled environments necessary for empirical research.

There have been four studies so far that have assessed psilocybin induced mystical experience during therapeutic trials using the 30-item Mystical Experience Questionnaire (MEQ30) (**Figure 3**). Each of these trials have shown a positive correlation both between dosage level and mystical experience scores and between mystical experience and long term positive outcomes (Griffiths et al., 2008 cited in Johnson et al., 2019). It is evident then, that mystical experience is a reliable predictor of positive therapeutic response to psychedelic treatment. Interestingly, Liechti et al., 2017 found a lower rate of mystical experience after LSD usage (17% of participants) compared to psilocybin (57% of participants). This might be explained by lower dosages, pharmacodynamic differences between these drugs, or differences in the setting or participant characteristics of these studies (Liechti et al., 2017 cited in Johnson et al., 2019). Further research should be done to evaluate the differences in the effects of these drugs, with particular attention to the induction of mystical experiences.

Risks

Of course, there are risks to the use of psychedelics. Johnson et al. (2019) categorizes these into three major categories: anxious, dysphoric, and confusing reactions more commonly referred to as a "bad trip", exacerbation

of already present or underlying psychotic disorders, and potentially risky short-term physiological effects such as a rise in blood pressure and heart rate, dose related headaches, and low ratings of nausea. Screening for predisposition to conditions that would be aggravated by these negative effects should be done for the safe use of these drugs for therapeutic purposes (Johnson et al., 2019).

While no contemporary studies have reported psychoses following administration of a psychedelic, rates for developing psychoses following the administration of LSD in the sixties and seventies range from .08% to 4.6% (Abraham et al., 1996 cited in Johnson et al., 2019).
Interestingly, classical psychedelics' effects show similarities to positive symptoms (e.g. thought disorder, inappropriate affect) of psychotic disorders but not negative symptoms (e.g. flat affect, lack of motivation) (Johnson et al., 2019).

Some studies have reported unwanted effects such as elevated blood pressure and heart rate, psychological discomfort (e.g. anxious reactions), and physical distress (e.g. nausea, vomiting, headache) to be common. Yet, they can be managed in the right setting and do not seem to have a negative effect on therapeutic benefit (Johnson et al., 2019).

Future Research

Common among all psychedelic research is the recognition of promising findings while acknowledging that most research with this class of drugs is still in its early stages. There is an imperative for larger studies, further research on potential risks and other limitations, and more research into the possible mechanisms underlying psychedelic drugs' effects. For this to happen,
a large amount of funding is necessary into this research, something which has not yet been seen at the federal level (Johnson et al., 2019).

This can be attributed to a general stigma against this field of study which is best characterized through the conservatism of key decision makers within governments, funding bodies, ethics boards, and mainstream scientific communities. Future methods should focus on increasing the accuracy of the readings between the spontaneous brain and the mind phenomena in question. It seems to be that one of the most pressing questions about psychedelic drugs relates to their increased "spontaneous states" (Carhart-Harris, 2018). This presents a challenge considering any manipulation may not be considered spontaneous but rather is artificially manipulated.

An example of the limitations of the current methods is the use of button-press tasks often used to signal to the observer a spontaneous event such as an auditory hallucination. There is an inherent delay that results from the motor actions necessary, the deliberation and finally intention to act which may create unreliable attributions. A better model might be to cue participants to report their experience at random intervals so as to impede as little as possible on the naturally unfolding experience of the psychedelic. Another suggestion for future methods might be the use of music to coax particular emotional responses during fMRI studies. In these instances, it would be necessary to brief participants about potentially adverse emotions given their susceptibility to suggestion in the psychedelic state. This would provide a more organic real time metric of the emotional response. Yet another idea, might be to somehow use the quality (in terms of rarity of adjectives and phrases and contingencies between words, phrases, and categories) of language in order to assess the level of entropy of a subject's psychedelic experience. Carhart-Harris (2018) proposes that the questions of how the psychedelic experience is sampled should be given equal weight as how the brain activity is recorded. After all, it should be the field's aim to increase the strength of the correlation between the two.

This field is also limited by the adverse attentional effects of psychedelic drugs. There is an increased inability to engage with stimuli that are not interesting to the participant while under the influence of the drugs (Carhart-Harris, 2018).

This can be related back to the definition of "mystical experience" provided and its suggestion of a transcendence of time and space and general distraction from everyday reality. This often leads to findings that are arguably uninteresting or irrelevant to the field.

In sum, the field of psychedelic therapy has come a long way since the Controlled Substances Act of 1970. A resurgence of interest has led to discoveries suggesting the altered connectivity of several crucial brain networks through various proposed mechanisms. This change in connectivity allows for the long-lasting establishment of novel connections that have the potential to induce behavioral changes useful in treating addiction and other psychiatric diseases.

Further research should also confirm the mechanism through which the anti-inflammatory properties of psychedelics such as R-DOI affect the central and peripheral nervous systems in order to know how to best use them for these properties.

Most importantly, in order for the field to keep progressing through these promising findings a shift away from conservatism and towards increased open mindedness about the potential of this class of drugs is necessary. It will be necessary for the field of psychopharmacology to move away from viewing psychedelic drugs as recreational substances for members of the counterculture in order to direct funding towards larger trials that will further elucidate their effects and potential benefits for therapy.

References

Carhart-Harris R. L. (2018). Serotonin, psychedelics and psychiatry. World psychiatry : official journal of the World Psychiatric Association (WPA), 17(3), 358–359. https://doi.org/10.1002/wps.20555

Carhart-Harris, R. L. (2018). The entropic brain - revisited. Neuropharmacology,142,167–178. https://doi.org/10.1016/j.neuropharm.2018.03.010

Carhart-Harris, R. L., Erritzoe, D., Williams, T., Stone, J. M., Reed, L. J., Colasanti, A., ... Nutt, D. J. (2011). Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. Proceedings of the National Academy of Sciences, 109(6), 2138–2143. https://doi.org/10.1073/pnas.1119598109

Carhart-Harris, R. L., Roseman, L., Bolstridge, M., Demetriou, L., Pannekoek, J. N., Wall, M. B., ... Nutt, D. J. (2017). Psilocybin for treatment-resistant depression: fMRI-measured brain mechanisms. Scientific Reports, 7(1). https://doi.org/10.1038/s41598-017-13282-7

Cole, D. M., Beckmann, C. F., Long, C. J., Matthews, P. M., Durcan, M. J., & Beaver, J. D. (2010). Nicotine replacement in abstinent smokers improves cognitive withdrawal symptoms with modulation of resting brain network dynamics. NeuroImage, 52(2), 590–599. https://doi.org/10.1016/j.neuroimage.2010.04.251

Johnson, M. W., Hendricks, P. S., Barrett, F. S., & Griffiths, R. R. (2019). Classic psychedelics: An integrative review of epidemiology, therapeutics, mystical experience, and brain network function. Pharmacology & Therapeutics, 197, 83–102. https://doi.org/10.1016/j.pharmthera.2018.11.010

Martin, D. A., & Nichols, C. D. (2016). Psychedelics Recruit Multiple Cellular Types and Produce Complex Transcriptional Responses Within the Brain. EBioMedicine, 11, 262–277. https://doi.org/10.1016/j.ebiom.2016.08.049

Nau, F., Miller, J., Saravia, J., Ahlert, T., Yu, B., Happel, K. I., ... Nichols, C. D. (2015). Serotonin 5-HT2 receptor activation prevents allergic asthma in a mouse model. American Journal of Physiology-Lung Cellular and Molecular Physiology, 308(2). https://doi.org/10.1152/ajplung.00138.2013

Nichols, D. E., Johnson, M. W., & Nichols, C. D. (2016). Psychedelics as Medicines: An Emerging New Paradigm. Clinical Pharmacology & Therapeutics, 101(2), 209–219. https://doi.org/10.1002/cpt.557

Petri, G., Expert, P., Turkheimer, F., Carhart-Harris, R., Nutt, D., Hellyer, P. J., & Vaccarino, F. (2014). Homological scaffolds of brain functional networks. Journal of The Royal Society Interface, 11(101), 20140873. https://doi.org/10.1098/rsif.2014.0873

Yu, B., Becnel, J., Zerfaoui, M., Rohatgi, R., Boulares, A. H., & Nichols, C. D. (2008). Serotonin 5-Hydroxytryptamine2A Receptor Activation Suppresses Tumor Necrosis Factor-α-Induced Inflammation with Extraordinary Potency. Journal of Pharmacology and Experimental Therapeutics, 327(2), 316–323. https://doi.org/10.1124/jpet.108.143461

Updating False Beliefs: The Relationship Between Paradoxical Knowing and Belief Updating

Amy Huang

Department of Psychology, New York University

Author's Note

Project funded by an NYU Dean's Undergraduate Research Funding (DURF) grant.

Abstract

Belief updating, the process of updating initial false beliefs to the correct ones after receiving corrective feedback, is pervasive in everyday life. The difference in individuals' reactions after receiving corrective feedback has been largely studied. Previous research mainly concentrated on discovering how individuals' levels of confidence and ideology related to belief updating. However, none of them has yet to incorporate the important aspect of misplaced certainty when processing information. Thus, our study investigated the relationship between certainty about the unknowable, termed as *paradoxical knowing*; and belief updating. Paradoxical knowing refers to a mental shortcut by subjectively claiming to know what is in fact unknowable (e.g., whether I will get married is unknowable, but I know I will). We hypothesized that if an individual has a higher tendency to firmly claim that he/she knows what is unknowable, they are less likely to change their minds even after receiving corrective information. In a survey, participants completed a baseline feedback learning test including general trivia statements followed by correct answers, individual difference measures, and a feedback learning re-test containing same questions as the baseline test. Results suggested that paradoxical knowing was negatively correlated with belief updating and can uniquely predict less belief updating over and above other variables related to closed-mindedness (e.g., right-wing authoritarianism, political ideology; Sinclair et al., 2020). Learning about potential factors that relate to individuals' resistance to correct false beliefs will be the first step to producing interventions to reduce such resistance, and thus, increase people's knowledgeability.

Keywords: certainty, knowing, epistemic structures, information processing, belief updating

The Relationship Between Paradoxical Knowing and Belief Updating

Updating misconceptions or false beliefs is critical for staying well-informed, especially in the face of rising misinformation. Misconceptions prevail in many life domains, including healthcare, education, politics, business, and the environment, as well as in our daily lives (e.g., Gunther et al., 2018; Walter et al., 2018). One effective way to update false beliefs is to assess corrective feedback. The process of changing existing false beliefs by learning from corrective feedback or a new piece of information is known as belief updating or feedback learning, which is a critical process to investigate further.

Intuitively, novel information from feedback should help people update original false beliefs and reduce the same kind of mistakes in the future. However, when novel information

overturns people's current beliefs, people in fact display distinct reactions: Some of them easily absorb the new information and update their original beliefs, while others are too stubborn to change their entrenched thoughts even false beliefs are clearly debunked (Lewandowsky et al., 2012; Southwell & Thorson, 2015). Understanding the factors underlying such variance in openness to corrective feedback is critical to foster learning from corrective feedback and thus address the personal and social costs of staying misinformed (Lewandowsky et al., 2012).

Belief Updating

Past research has identified several cognitive and motivational factors underlying the resistance to updating false beliefs. The research on belief updating started with identifying distinctive effects of different types of feedback (Pashler et al., 2005). For example, Fazio et al. (2010) conducted experiments on college students to explore the impact of right/wrong feedback on performance improvement in reciting critical facts. Their findings suggested that right/wrong feedback did not improve individuals' error correction ability but was helpful for people to retain those low-confidence correct answers (Pashler et al., 2005). Thus, dichotomous feedback could aid belief updating to some extent but not as effectively as feedback with details (Fazio et al., 2010).

Later, researchers concentrated on investigating how people's degrees of confidence in the answers correlated with their capability of belief updating. Watabe-Uchida and colleagues (2017) found that prediction error, the discrepancy between expectation and reality, is correlated with people's capability of belief updating. Such that, a greater prediction error reinforces the capability of updating and learning from surprising feedback. This phenomenon is defined as *hypercorrection effect*, which means high-confidence errors are more likely to be corrected after feedback than low-confidence errors due to increased mindfulness of the surprising feedback. This effect improves individuals' later memory of their previous misconceptions in turn (Butterfield & Metcalfe, 2001; Fazio & Marsh, 2009). However, empirical findings suggested that the hypercorrection effect did not always lead to successful belief updating; therefore, researchers shifted gears to other variables that could potentially relate to people's belief updating process (Filipowicz et al., 2018).

More recently, Sinclair et al. (2020) investigated the role of people's thinking styles in belief updating processes. They found right-wing authoritarianism, a closed-minded cognitive thinking style for people who tend to be submissive to authorities, was negatively related to belief updating. Right-wing authoritarianism indicates the ideological commitment to tradition, authority, and social convention against threats of change, protest, and political rebellion (Jost et al., 2003). It is a subdimension of political conservatism that relates to a lower openness to change, so it is not surprising to observe a significant relationship between this subdimension of ideology and a lower tendency of belief updating in general (Jost et al., 2003). However, the general political conservatism did not have a significant correlation with the belief updating process (Sinclair et al., 2020). Thus, it is reasonable to suspect that what correlates with difficulties in updating is not merely the ideology per se (e.g., voting tendency) but other factors that may also underlie ideology.

Initial Certainty

Although past research has identified cognitive and motivational factors underlying the tendency to preserve false beliefs, a limited amount of research has examined the epistemic predictors of poor updating (e.g., subjective sense of certainty). To further clarify the impactful factors associated with belief updating, Li and Wagner (2020)'s study based on individuals' states of being informed in polarized topics revealed that the existence, the certainty, and the accuracy of one's original beliefs were related to the

effectiveness in belief updating. They divided samples into three groups in terms of their states of being informed about multiple partisan issues: the uninformed (people with no prior beliefs), the ambiguous (people with uncertain beliefs), and the misinformed (people with certain but wrong beliefs). Similarly, researchers defined those certain, correct answers as "informed," and certain and incorrect answers as "misinformed". Uncertain answers, whether correct or incorrect, were defined as "ambiguous". Specifically, they found that there was a positive relationship between the level of certainty about a specific belief and the resistance to updating that belief in response to corrective feedback. That is, uninformed people were more likely to update their beliefs than people who were misinformed, while ambiguous individuals showed no difference from uninformed individuals in belief updating. This empirical finding provided an initial explanation of the impact of initial certainty on belief updating.

Later, Grant (2021) emphasized the importance in understanding initial certainty by stating that "if we're certain that we know something, we have no reason to look for gaps and flaws in our knowledge, let alone fill or correct them" (p. 42). Initial certainty can induce many unconscious biases, such as belief perseverance, which had been defined as "the tendency to cling to one's initial belief even after receiving new information that contradicts or disconfirms the basis of that belief" (Baumeister & Vohs, 2007, p. 109). Therefore, individuals with strong belief perseverance are less likely to update their false beliefs based on corrective feedback.

Taken together, we suggest that a critical obstacle in the way of updating false beliefs should be one's tendency to hold on to their initial misinformed beliefs with high certainty. We need to further investigate the role of people's initial belief certainty in belief updating and examine whether chronic certainty will be an even stronger individual difference factor than right-wing authoritarianism in predicting belief updating.

Certainty mentality can be conceptualized in different ways as one can be certain about things that are knowable (scientific facts where data are available) or things that are unknowable. People may not want to give up on their certainty of original ideas as they are likely to treat it as a form of possession and feel averse to losing such possession (Abelson, 1986; Tversky & Kahneman, 1991). This can especially be the case when their certainty is misplaced, namely, when they feel certain about something that they should not be certain about. For example, people technically cannot be certain about unknowable information like future outcomes since they cannot know the future. Mitzen and Schweller (2009) introduced the term misplaced certainty as holding an unwarranted certainty about things despite the presence of disconfirming evidence. That is, misplaced certainty is a motivated bias with cognitive and affective roots, serving the basic need to reduce uncertainty.

Different Forms of Epistemic Certainty

One of the recently investigated forms of epistemic misplaced certainty is paradoxical knowing (There are three components of paradoxical knowing: knowing, unknowable, and epistemic paradox (Gollwitzer & Oettingen, 2019). In terms of knowing, it refers to subjective knowledge, claiming to know or feeling certain about something, and a higher degree of certainty compared to simply holding beliefs about the unknowable (which includes some room for doubt as in faith). The second component of paradoxical knowing is unknowable, meaning to subjectively perceive one's knowledge as unknowable. Finally, self-certainty and unknowability being together creates an epistemic paradox.) where individuals subjectively claim certainty in knowing what is unknowable (Gollwitzer & Oettingen, 2019). Paradoxical knowing is a form of misplaced certainty because people are certain about something unknowable that they should indeed not be certain about. Theoretically, people develop paradoxical knowing as a mental shortcut to avoid uncertainty and make quicker decisions (Gollwitzer & Oettingen, 2019). For example,

people claim that they will definitely break up with their lovers although they recognize that their future is unknowable.

To isolate the role of misplaced certainty in belief updating, it was also necessary to investigate other epistemic structures (other than misplaced certainty) that relate to one's initial certainty and their relation to belief as well. Gollwitzer and Oettingen (2019) differentiated paradoxical knowing from concordant knowing. Compared to paradoxical knowing, concordant knowing is a well-placed certainty since it refers to certainty about something that most others affirm (e.g., scientific data and objective trends). Concordant knowing shows certainty in knowable things and in the face of others' confirmation (e.g., "I am certain that the capital of Australia is Canberra that is an objective fact and can be affirmed by most others"). Meanwhile, compared to normal believing in the unknowable, paradoxical knowing incorporates a stronger degree of certainty (e.g., "I believe God exists" vs. "I know God exists").

Previous research studies supported the notion of paradoxical knowing by indicating that feeling certain about unknowable information (e.g., the future) induced confirmation bias, enabling people avoid new pieces of evidence that contradict with their existing beliefs (Clark et al., 2008; Rollwages et.al., 2019; Olcaysoy Okten et al., 2022). That is, if an individual has higher certainty of knowing what is unknowable, it is less likely for them to change their minds after receiving corrective outside information. More importantly, paradoxical knowing has been associated with an epistemic threat that stems from the feeling of an internal or external (respectively) doubt or opposition, and in turn, defensive reactions in the form of determined ignorance and antisocial tendencies. Specially, individuals will be reluctant to change their original beliefs and assimilate new information if they have the misplaced certainty of unknowable knowledge because of determined ignorance (A. Gollwitzer & Oettingen, 2019). That is, people who hold greater paradoxical knowing were more likely to report that they ignore information that opposes their viewpoint and even aggress toward skeptics (Gollwitzer & Oettingen; 2019; Gollwitzer et al., 2022).

In addition, unlike right-wing authoritarianism, which is a construct referring to a specific ideology, paradoxical knowing is an epistemic structure that should generalize across different ideological tendencies. Therefore, the identified relationships between paradoxical knowing and belief updating should hold true independent of such ideological close-minded cognition. Moreover, in recent research by Gollwitzer et al. (2022), unlike paradoxical knowing, concordant knowing did not lead to defensive reactions such as ignorance or hostility. Gollwitzer and Oettingen (2019) found that the relationship between paradoxical knowing and ignorance of opposing information held true even after controlling for concordant knowing. Taken together, we hypothesized that:

Hypothesis 1: Paradoxical knowing would negatively correlate with belief updating, such that high paradoxical knowers would be less likely to update false beliefs compared to low paradoxical knowers.

Hypothesis 2: Paradoxical knowing would explain a significant amount of variance in belief updating over and above other forms of certainty (e.g., concordant knowing, believing about the unknowable) and ideology (e.g., right-wing authoritarianism, political conservatism).

Research Overview

Our research examined the role of individuals' initial certainty about the unknowable, termed as *paradoxical knowing*, in their belief updating process. Since paradoxical knowing is a newly generated concept, no research about its correlation with belief updating has been published so far. Therefore, the goal of our research was to understand whether paradoxical knowing motivates one's disregard of corrective information and thereby foster the perseverance of

false beliefs by investigating the relationship between paradoxical knowing and belief updating. We aimed to only focus on people's existing misconceptions and see whether people update their original false beliefs to the correct ones after receiving corrective feedback. Besides our main predictor, paradoxical knowing, we also examined correlations between other epistemic structures (e.g., concordant knowing, paradoxical not knowing, and believing in the unknowable) and belief updating to determine which epistemic structures have significant correlations with belief updating. Furthermore, we controlled previously investigated parameters, including right-wing authoritarianism and political ideology, to test whether our main predictor, paradoxical knowing, can explain a significant amount of variance in belief updating over and above these variables. These analyses helped us understand which component was better at predicting individuals' capability of belief updating, ideology or certainty.

Method

Our measures and analysis plan were pre-registered here: https://osf.io/wdgnb.

Participants

We recruited 250 U.S. resident Amazon Mechanical Turk workers in total who voluntarily participated in the study for monetary compensation (73 female, 160 male, 1 non-binary, 1 unknown, M_{age} = 36.92 years, SD_{age} = 10.696 years). Participants were compensated with a total of $3.25 for approximately thirty-minute participation. The minimum target sample size (N = 250) was determined prior to data collection based on results from an exploratory pilot study. Our estimated effect size (r = -.32) was based on the correlations between two forms of certainty about the unknowable and belief updating in our pilot data (with paradoxical knowing: r = -.32; with discordant knowing: r = -.35; we selected the lower effect size for a conservative test) with 80% estimated power and an alpha of .05. Since we planned to perform linear multiple regression in the following sections, we set the test family as *F tests* and statistical test as *linear multiple regression: Fixed model, R^2 increase* when doing power analysis. We tested the significance of paradoxical knowing in the model with control variables including right-wing authoritarianism, political ideology, social desirability, and epistemic structures which show significant correlations with belief updating. Thus, we can set the number of tested predictors as 1 and the total number of predictors as 6 (including the control variables). Then, the analysis suggested that we should get at least a total sample size of 152 participants to achieve the actual power approximately at 80% ($\alpha = .05$, $1-\beta = .80$). Due to the possibilities of failing attention checks and other noises, we set the minimum targeted sample size at 250 participants. Ultimately, 15 participants were excluded for failing attention checks (as pre-registered). After the exclusion, the final sample consisted of 235 participants.

Overall Procedure

During the study, all participants filled out the online Qualtrics survey. Our study had a correlational design, including our main predictor, paradoxical knowing, and outcome variable, belief updating. All participants saw the exact same tasks, with items within each task presented in a random order for each participant to reduce order effects. The survey consisted of the following tasks in this order: consent form, baseline feedback learning test (see Appendix A), individual difference measurements (see Appendix B), feedback learning re-test, and demographics. All participants began the online study by providing e-signing consent in accordance with the Institutional Review Board at New York University.

After participants signed the consent form, they completed the baseline feedback learning test, answering sixty true-or-false questions presented in a random order. Then, they spent five to ten minutes finishing the individual difference

measurement. Later, they completed the feedback learning re-test that included the exact same sixty trivia statements as the baseline feedback learning test presented in a random order. Finally, after participants filled out demographic questions, they were fully debriefed and granted monetary compensation. All participants were only allowed to complete the survey once.

Materials

Feedback Learning Task. We assessed participants' belief updating via a feedback learning task. Participants were tested on 60 trivia statements (forty misconceptions and twenty correct statements) randomly selected from Sinclair et al.'s (2020) feedback learning task. Originally, Sinclair et al. (2020) employed 120 trivia statements to assess participants' effectiveness of belief updating. To ensure participants' attention to the survey, we shortened the duration of the survey within a 30-minute session by only including sixty representative statements, which contained forty misconceptions and twenty correct statements about various fields of knowledge from our daily life (see Appendix A). The following statements are examples with the correct answer in the parentheses: Thomas Edison invented the lightbulb (FALSE); spinach is high in iron (TRUE). The true statements here are to act as the role of "fillers". We wanted to mix up all misconceptions and true statements so that participants' knowledge was affirmed in at least some of the trials (this also prevents receiving a perfect score by repeatedly clicking on "false").

In total, there were two rounds of tests; the first round was a baseline feedback learning task. In this first round, participants reviewed each statement one by one and indicated their accuracy by clicking on TRUE or FALSE options. After answering each question and reporting the degree of confidence (0: *Not at all confident*; 100: *Very confident*), the correct answer to the question was given ("This statement is FALSE/TRUE"). We used the function of "delay showing submit button" on Qualtrics to display the "submit" button after two seconds to leave some time for participants to fully process the information on the screen and reduce the influence of inadequate attention or random guesses for questions. Then, participants were asked to finish the individual difference measures, and upon completion of these measures, they completed feedback learning re-test. All questions in the second-round test were the same as those in the first round but shown in a different random order.

To operationalize individuals' belief updating scores, we calculated how likely people corrected their mistakes on average. Specifically, we coded each statement that was answered incorrectly on both the baseline test and the re-test as 0, which means participants did not update their existing false beliefs. And we coded those statements answered incorrectly on the baseline test but correctly on the re-test as 1, which means participants updated their original false beliefs on this single statement. We temporarily ignored those questions that were answered correctly by participants in the baseline test. Then, we averaged those scores and got individuals' belief updating scores. This number corresponded to the likelihood of updating initially incorrect beliefs. For example, participants received a score of .50 if they updated half of their incorrect beliefs.

After answering each question, participants were also asked to evaluate their confidence (0 to 100) about their responses for exploratory purposes. Consequently, we could explore if paradoxical knowing related to the degree of confidence or prediction error. We averaged the level of confidence on those statements that were answered incorrectly on the baseline test to get individuals' scores of prediction error for future analyses.

Epistemic Certainty. We assessed different forms and levels of epistemic certainty, namely, paradoxical knowing, concordant knowing, paradoxical not knowing, and believing in the unknowable for further correlational analysis. We measured one's degree of paradoxical knowing via two subscales. The first one was the general scale of measurement, also known as the internal state

of paradoxical knowing (One of the derivatives of paradoxical knowing is paradoxical not knowing that people don't know things that one can know. It contains same components as paradoxical knowing but has opposite certainty to show certainty in ignorance for things that should be known) (the internal sense of knowing the unknowable; Gollwitzer & Oettingen, 2019). This was measured via a three-item scale, including claims that "I know things that one can't actually know", "I know things that can't be known", and "I know things that are unknowable" (PK; 1 = *not at all agree* to 7 = *strongly agree*; Gollwitzer & Oettingen, 2019; α = .920). As human beings are social animals, understanding others' attitudes towards certain ideas can also exert influence on one's thinking. To offer a more comprehensive measurement of paradoxical knowing, we also tested the social version of paradoxical knowing. This subscale focused on the discrepancy between self-certainty (internal) and the certainty of others (external), which was known as discordant knowing (e.g., I know God exists, but others claim it is unknowable; Gollwitzer et al., 2022). Discordant knowing was also evaluated by a three-item scale: "I know things where most other people will say one can't know them", "I know things that most other people will say can't be known", and "I know things that most other people will say are unknowable" (DK; 1 = *not at all agree* to 7 = *strongly agree*; Bläser & Oettingen, 2021; α = .914). Paradoxical knowing and discordant knowing were strongly positively correlated (r = .821) and loaded to one factor (α = .944). Thus, we averaged the score of six items to calculate people's degrees of paradoxical knowing on the numerical scale. Examples of other epistemic structures (that were used as epistemic control variables) consisted of the following: concordant knowing (e.g., "I am certain about something that most others affirm"; α = .818), paradoxical not knowing (e.g., "I don't know things that one can know"; α = .886), and believing (e.g., I believe things that one can't actually know"; α = .881). Each of these structures were tested via three item scales.

Other Control Variables. As we wanted to focus on the correlation between belief updating and paradoxical knowing, we needed to control for shown predictors of belief updating as well as the epistemic structures that showed significant correlations with belief updating. To this end, we measured individuals' right-wing authoritarianism and political ideology as part of the individual difference measures because right-wing authoritarianism has been shown to have significant correlations with belief updating, and conservatism is related to paradoxical knowing (Sinclair et al., 2012). Participants were measured on right-wing authoritarianism with 15 items (RWA; 1 = *not at all agree* to 7 = *strongly agree*; Zakrisson, 2005; α = .826). The RWA scale includes the following example items: "Our country needs a powerful leader, in order to destroy the radical and immoral currents prevailing in society today". Also, we measured participants' political affiliation (1 = *very liberal* to 4 = *neither liberal nor conservative* to 7 = *very conservative*) in the demographic section.

Social Desirability. To assess whether participants responded to questions of epistemic structures and control variables' assessments in a way they deem to be more socially acceptable instead of choosing answers that are closest to their true thoughts and feelings, we added social desirability questions in our survey. We employed 14 items including the statement: "it is sometimes hard for me to go on with my work if I am not encouraged" (SD; Reynolds, 1982), and enabled participants to choose whether they thought those statements are true or false. (M = .47, SD = .22; α = .664)

Attention Checks. To examine whether participants' attention stayed on our survey, we added three attention checks throughout the survey, two in the section of the baseline feedback learning test and one in the section of the feedback learning re-test. Our attention checks required participants to follow the instruction we provided in the prompt, like "set your confidence rating at 80". If participants failed any two of three attention checks, like choosing a different item

from the one we mentioned, we excluded all their data from our analyses.

Discouraging Cheating. Since our statements involved objective information, participants had incentives to search for answers on the internet. Although it was impossible for us to fully eliminate cheating, we have initiated the following steps to minimize its influence. First, in our consent form, we explicitly pointed out that the monetary compensation is fixed regardless of the number of questions that participants answer correctly. Then, we measured the time that participants spent on each question, including specific seconds on the first click, the last click, page submit, and click count. We identified participants who spent an excessive amount of time (page submit time > 9s; see Sinclair et al., 2020) as those who had the chance to cheat or distract. Consequently, we repeated the analyses after excluding long-time responses and got the same results as the analyses including full response trials (See Supplemental Analyses). Last, we asked participants a question that "have you looked up any of the correct answers before responding to the trivia questions in this study?" at the end of our survey. Since our survey was designed as forward answering, no participants were able to go back to answer previous questions once they clicked the "next" button. Thus, this design did not affect their answers to previous questions.

Analysis Methods

Correlational Analyses. First, we ran the correlational analyses, statistically assessing Pearson's r between all epistemic structures and belief updating. Besides paradoxical knowing, we also identified what other epistemic structures correlated with belief updating and regarded these epistemic structures as control variables in the following regression model.

Linear Regression. The second part of our analysis was based on multiple regression analyses. We built a regression model to directly test the relationship between belief updating and our main predictor, paradoxical knowing, by controlling for other variables: right-wing authoritarianism, conservatism (Sinclair et al., 2012), social desirability, and other epistemic structures that showed significant correlations with belief updating in our first part analysis, to examine whether paradoxical knowing is a unique predictor of the perseverance of false beliefs.

Results

Investigating the relationship between paradoxical knowing, a misplaced certainty to know what is actually unknowable, and belief updating, we hypothesized that paradoxical knowing is significantly negatively correlated with belief updating and can help to explain the significant amount of variance in individual differences in belief updating. With 235 valid data points, our data supported our hypothesis, showing that there is a negative correlation between paradoxical knowing and belief updating, and paradoxical knowing can help to explain significant amount of variance over and above other parameters (e.g., right-wing authoritarianism, political conservatism).

Correlations

First, we ran bivariate correlational analyses between all epistemic structures (paradoxical knowing, concordant knowing, paradoxical not knowing, and believing in the unknowable) and the effectiveness of belief updating through SPSS. Belief updating was operationalized as the average tendency of successfully correcting a false belief among the items where participants held a false belief in the baseline feedback learning test (M_{FL} = .65, meaning that across all participants, the level of updating was 65%). Epistemic structures (other than paradoxical knowing) which showed significant correlations with belief updating were identified as control variables to be used in our multiple linear regression analysis. Descriptive statistics for parameter estimates are provided in

Table 1.

Variable	*M*	*SD*	2	3	4	5	6	7	8
1. Belief updating	.65	.30	-.390***	-.301***	.180**	-.071	-.219**	-.271***	-.117
			[-.508, -.261]	[-.407, -.178]	[.020, .327]	[-.208, .068]	[-.350, -.081]	[-.391, -.150]	[-.243, .009]
2. Paradoxical knowing	3.89	1.81	-	.529***	-.012	.173**	.578***	.284***	.085
				[.418, .633]	[-.162, .132]	[.017, .316]	[.458, .687]	[.173, .402]	[-.059, .235]
3. Right-wing authoritarianism	3.97	1.86		-	-.239***	-.181**	.297***	.399***	.199**
					[-.395, -.091]	[-.324, -.035]	[.131, .442]	[.293, .499]	[.034, .349]
4. Concordant knowing	5.36	1.28			-	.308***	.148*	-.208**	-.112
						[.159, .452]	[.003, .303]	[-.358, -.064]	[-.260, .026]
5. Paradoxical not knowing	5.36	1.28				-	.333***	.067	-.023
							[.171, .477]	[-.067, .203]	[-.151, .114]
6. Believing in the unknowable	4.46	1.71					-	.183**	.089
								[.052, .311]	[-.045, .238]
7. Political conservatism	4.29	2.28						-	.029
									[-.098, .155]
8. Social Desirability	.47	.22							-

Note. 95% confidence intervals were calculated through bootstrapping and provided in brackets. *$p < .05$, **$p < .01$, ***$p < .001$

Table 1: Descriptive Statistics and Correlations Among Individual Difference Measures

Internal Consistency

We found that discordant knowing (a subscale of paradoxical knowing) was strongly positively correlated with general paradoxical knowing ($r = .821$). As the internal consistency of scales of paradoxical knowing ($\alpha = .920$; $N = 3$; see Table 2) and discordant knowing ($\alpha = .914$; $N = 3$; see Table 3) were high respectively, the internal consistency for six items together was also high ($\alpha = .944$; $N = 6$; see Table 4). After doing a factor analysis, we found that items were loaded to one factor which consolidated our decision to collapse across these subscales (see Table 5). Thus, we did the analyses by collapsing across general paradoxical knowing and discordant knowing, calculating the degree of paradoxical knowing for each individual by averaging six items together.

	Corrected Item-Total Correlation	Cronbach's Alpha of Item Deleted
Item 1	.848	.877
Item 2	.861	.866
Item 3	.807	.911

Table 2: Internal Consistency for the Items of General Paradoxical Knowing

	Corrected Item-Total Correlation	Cronbach's Alpha of Item Deleted
Item 1	.827	.877
Item 2	.819	.885
Item 3	.837	.869

Table 3: Internal Consistency for the Items of Discordant Knowing

	Corrected Item-Total Correlation	α of Item Deleted
PK_1	.853	.931
PK_2	.836	.933
PK_3	.815	.936
DK_1	.818	.935
DK_2	.836	.933
DK_3	.824	.934

Table 4: Internal Consistency for the Items of Paradoxical Knowing and Discordant Knowing Together

Component	Initial Eigenvalues % of Variance	Cumulative %
1	78.178	78.178
2	7.791	85.969
3	4.344	90.313
4	3.728	94.041
5	3.396	97.436
6	2.564	100.000

Note. Extraction Method: Principal Component Analysis

Table 5: Factor Analysis for the Items of Paradoxical Knowing and Discordant Knowing

The Relationship between Belief Updating and Epistemic Structures

Our data showed that paradoxical knowing had a moderate negative correlation with belief updating (r = -.390, p < .001; See Fig. 1), with a lower degree of paradoxical knowing predicting greater updating success. This relationship was the largest among all correlations between epistemic variables and belief updating. Replicating what Sinclair et al. (2020) found, right-wing authoritarianism was also negatively correlated with belief updating (r = -.301, p < .001).

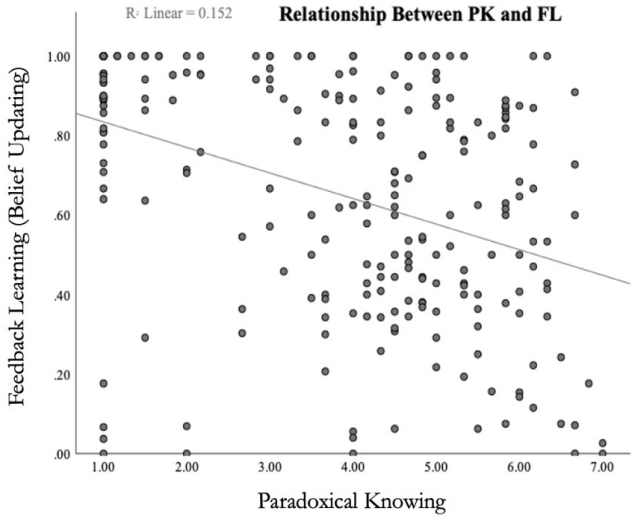

Figure 1: The Relationship Between Paradoxical Knowing and Belief Updating (Feedback Learning)
Note. Paradoxical knowing was negatively correlated with belief updating. Points depict subject averages.

Unlike paradoxical knowing, concordant knowing was positively correlated with belief updating, predicting more updating (r = .180, p < .01; See Fig. 2). Therefore, we included concordant knowing in our linear regression model as another predictor.

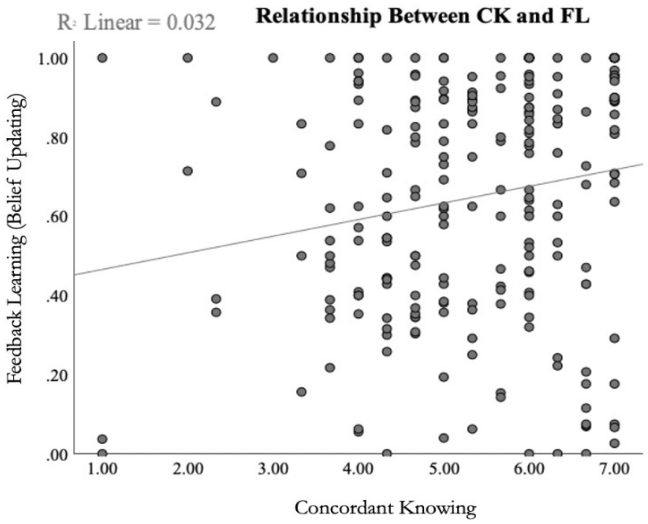

Figure 2: The Relationship Between Concordant Knowing and Belief Updating (Feedback Learning)Note. Concordant knowing was positively correlated with belief updating. Points depict subject averages.

Besides aforementioned correlations, we also measured relationships among other variables. Paradoxical not knowing did not show a significant correlation with belief updating (r = -.071, p = .276; See Table 1), while believing in unknowable had a significant negative correlation with belief updating (r = -.219, p < .001; See Table 1). We also found that political conservatism showed a significant negative correlation with belief updating, which was inconsistent with what Sinclair et al. (2020) has found previously. This can be due to the different distribution of political orientation in our sample. Our sample (M_{pc} = 4.29) was more conservative leaning than Sinclair et al.'s (2020; M_{pc} = 2.67), which may have contributed to lower belief updating observed among conservative individuals. We included all variables which showed a significant correlation with belief updating as control variables in the regression model, as pre-registered.

Paradoxical Knowing Explains a Significant Amount of Variance in Belief Updating

Then, we conducted a multiple linear regression, building a regression model to directly test the relationship between belief updating and our main predictor, paradoxical knowing. We controlled for other variables including right-wing

authoritarianism, conservatism, social desirability (Sinclair et al., 2012) as well as epistemic structures that showed significant correlations with belief updating in our first-stage correlation analyses (concordant knowing, believing in the unknowable). Thus, in the model, the dependent variable was belief updating, and the predictors for the model were paradoxical knowing, concordant knowing, believing about the unknowable, right-wing authoritarianism, political conservatism, and social desirability. This way, we could examine whether paradoxical knowing uniquely predicted lower updating over and above these other parameters (see Table 6).

Predictors	Standardized Coefficient Beta	*t*	Sig.	*95.0% Confidence Interval for B*	
				Lower Bound	Upper Bound
(Constant)		-.168	.866	-.128	.108
Paradoxical knowing	-.309	-3.733	< .001	-.473	-.146
RWA	-.038	-.495	.621	-.191	.114
Concordant Knowing	.133	2.063	.040	.006	.261
Believing in Unknowable	-.015	-.201	.841	-.162	.132
Political Conservatism	-.135	-2.021	.044	-.266	-.003
Social Desirability	-.079	-1.283	.201	-.202	.043

Note. RWA = Right-wing authoritarianism. All variables were fully standardized.

Table 6: Linear Regression Estimates for the Effect of Paradoxical Knowing on Belief Updating

In our analysis, as we expected, we found that paradoxical knowing could help to explain a significant amount of variance ($t(233) = -3.795$, $p < .001$) in the negative direction in predicting belief updating. Conversely, concordant knowing explained a significant amount of variance in the positive direction, showing more updating ($t(233) = .137$, $p = .034$). Political conservatism also predicted lower updating ($t(233) = -.133$, $p = .048$). Right-wing authoritarianism, which has been shown to predict resistance to updating false beliefs in past research (Sinclair et al., 2020), was no longer a significant predictor after controlling for paradoxical knowing. Believing in the unknowable and social desirability did not predict belief updating in this model either. These results showed that paradoxical knowing uniquely predicts lower belief updating over and above other variables. In addition to paradoxical knowing, concordant knowing and conservatism also emerged as predictors of sticking to false beliefs in this model.

Discussion

The present study aimed to advance the understanding of (1) the relationship between paradoxical knowing, high certainty to know what is actually unknowable, and belief updating; (2) whether paradoxical knowing can better predict belief updating compared to previously measured parameters (e.g., right-wing authoritarianism, political conservatism; Sinclair et al., 2020). Based on previous studies shown that paradoxical knowing would result in determined ignorance of corrective feedback (Gollwitzer & Oettingen, 2019), we generated our hypotheses that paradoxical knowing (1) was negatively correlated with belief updating and (2) explained a significant amount of variance in addition to existing variables. We employed the paradigm about the tendency to correct the false beliefs on urban myths upon corrective feedback to test our hypotheses (Sinclair et al., 2020). Our results supported both hypotheses. That is, high paradoxical knowers were less likely to update their false beliefs. We found that paradoxical knowing, right-wing authoritarianism, believing in the unknowable, and political conservatism showed significant negative correlations with belief updating, while there was a significant positive correlation between concordant knowing, high certainty to know what is knowable, and belief updating after controlling for other variables. Meanwhile, paradoxical knowing was shown to uniquely predict less belief updating. On the contrary, concordant knowing was shown to uniquely predict more belief updating.

Implications

Belief updating requires memory systems (Sinclair et al., 2020). People's effectiveness of belief updating is differential when utilizing

different types of feedback for information processing (e.g., Fazio et al., 2010; Butler et al., 2013; Metcalfe, 2017). Rather than focusing on the feedback itself, the present study about chronic certainty provides three major contributions to the current theoretical framework. First, the present study empirically tested a recently developed epistemic structure, paradoxical knowing, as a unique predictor of perseverance of false beliefs or misinformation. The present study will aid future research by providing a fundamental example of the direct effect with multiple control conditions. Second, the present study found that paradoxical knowing predicts belief updating in contrary directions compared with concordant knowing. This finding made both theoretical and empirical distinction between paradoxical knowing and concordant knowing. With this distinction, the present study paved the way to systematically examine the conditions and domains where certainty is experienced in a misplaced or well-placed form in the future. Third, the evidence from this rising area of research on misplaced certainty at the individual level is largely based on self-reported ignorance (e.g., agreeing with the statement that "you don't really have to consider all information;" Gollwitzer & Oettingen; 2019) and little is known about the behavioral manifestations of ignorance as an outcome of misplaced certainty. This is the first study, to our knowledge, examining the relationship between certainty about the unknowable and resistance to updating false beliefs by using a behavioral (performance-dependent) rather than a self-report measure of information processing and updating, which better fills the current gap between certainty mentality and belief updating.

Paradoxical knowing can be overserved in many domains (e.g., educational, business, romantic relationships). Our study showed that a general sense of certainty-feeling like knowing the unknowable independent of a domain-may trigger resistance in belief updating. In general, such kind of misplaced certainty is handicapping in learning and updating process. Having certain degree of doubt is a beneficial thing for individuals since we can be open to more knowledge and update original false beliefs in time. Therefore, this topic is important to study as in an environment filled with misinformation it is essential to discover factors that underlie people's stubborn beliefs. It will also be the first step to producing certain interventions in the future.

There are many potential practical implications based on our current research. For example, in terms of social works, our results suggested that the public education program should carefully evaluate the local knowledge and students' degree of uncertainty to properly develop the plan of education. Having the sense of knowing unknowable creates difficulties for students to learn since they feel they have already known most of the knowledge. At this point, our research can offer new insights for teachers and parents to better educate their children with proper feedback and encourage their kids to perform open-minded thinking (e.g., Stanovich & West, 1997).

Future Research

Future research should move beyond the current effort in many ways. First, since we only provided correct answers to participants during the survey, our current research cannot examine what will happen if people originally hold correct beliefs but are constantly exposed to misinformation, like false feedback. This is vital to investigate especially for low paradoxical knowers. Low paradoxical knowers can be more open to any kind of information, including false feedback. Therefore, even if they receive wrong information, it is likely for them to update their original correct beliefs to the wrong ones. Updating in the reverse direction may be dangerous, and therefore, should be further studied.

In addition, future research can also investigate how people perceive feedback. More research associated with the underlying cognitive process for current findings should be done. Previous research illustrated that there was a significant correlation between intuitive thinking

and paradoxical knowing, supporting that paradoxical knowing is a shortcut to knowledge that can be momentarily induced. (Gollwitzer & Oettingen, 2019). However, the mechanism of their relationships that whether high paradoxical knowers updated false beliefs less likely due to a sense of epistemic threat or lower attention to corrective feedback still remains unclear without doing further research.

Limitations

The current study leveraged the understanding of belief updating with a close consideration on potential epistemic factors. However, the current study contains following limitations. First, the paradigm we used to measure false beliefs in the current study was limited to everyday misconceptions about which one may not hold strong opinions. Future research can examine whether our findings can be generalized to other areas, especially which are deemed personally and socially important (e.g., political views). Similarly, future studies can study social groups with greater diversity to discover the potential influence of socio-cultural factors on belief updating.

Second, we found that the relationship documented in Sinclair et al.'s (2020) study between right-wing authoritarianism and belief updating became nonsignificant after accounting for paradoxical knowing in our model. Also, consistent with past work (Study-Set 3 in Gollwitzer & Oettingen, 2019), those with higher right-wing authoritarianism reported more paradoxical knowing ($r = .53$, $p < .001$). However, we refrain from concluding that paradoxical knowing embraced by those with high right-wing authoritarianism is the reason why they did not revise their false beliefs, as our study design was correlational and cross-sectional. The exact role of paradoxical knowing in the relationship between right-wing authoritarianism and lower belief updating should be tested through studies designed to answer this question.

In addition, we found different relationships from Sinclair et al.'s (2020) study between general conservatism and belief updating. In their study, there was no significant correlation between political conservatism and belief updating, while we found a significant negative correlation between them. We suspected that this discrepancy may be caused by the difference in the distribution of ideology across samples. Our sample was skewed towards more conservative ($M_{pc} = 4.29$) than Sinclair et al.'s (2020; $M_{pc} = 2.67$). However, further research needs to be done to verify the relationship between general conservatism and belief updating. Lastly, we only controlled for a limited number of variables in the current study. There are potentially more variables correlated with individuals' belief updating process that need to be investigated further.

Conclusion

As we are exposed to increasing diverse information today, both correct knowledge and misinformation, it is crucial to explore what factors correlate with people's belief updating process to help us distinguish right from wrong and stay knowledgeable. In the present study, we investigated the relationship between certainty about the unknowable-paradoxical knowing-and updating false beliefs. Paradoxical knowing, the misplaced certainty of knowing what is unknowable, was negatively correlated with the tendency to update false beliefs and explained a significant amount of variance over and above other parameters. Understanding the role of paradoxical knowing in individuals' belief updating process is necessary to help individuals stay well-informed and help researchers design interventions that can reduce perseverance of false beliefs. We encourage future research to build upon our efforts showing the importance of initial certainty (about the unknowable) in the effectiveness of belief updating or lack thereof.

References:

Abelson, R. P. (1986). Beliefs are like possessions. *Journal for the Theory of Social Behaviour*, *16*, 223-250. https://doi.org/10.1111/j.1468-5914.1986.tb00078.x

Baumeister, R. F., & Vohs, K. D. (2007). *Encyclopedia of Social Psychology*. Sage Publications. https://books.google.com/books?id=CQBzAwAAQBAJ

Bläser, A. & Oettingen, G. (2021). *Discordant Knowing Scale* [Unpublished raw data].

Butler, A. C., Godbole, N., & Marsh, E. J. (2013). Explanation feedback is better than correct answer feedback for promoting transfer of learning. *Journal of Educational Psychology*, *105*(2), 290. https://doi.org/10.1037/a0031026

Butterfield, B., & Metcalfe, J. (2001). Errors committed with high confidence are hypercorrected. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *27*(6), 1491-1494. https://doi.org/10.1037//0278-7393.27.6.1491

Clark, J. K., Wegener, D. T., & Fabrigar, L. R. (2008). Attitudinal Ambivalence and Message Based Persuasion: Motivated Processing of Proattitudinal Information and Avoidance of Counterattitudinal Information. *Personality and Social Psychology Bulletin*, *34*(4), 565 577. https://doi.org/10.1177/0146167207312527

Fazio, L. K., Huelser, B. J., Johnson, A., & Marsh, E. J. (2010). Receiving right/wrong feedback: consequences for learning. *Memory (Hove, England)*, *18*(3), 335-350. https://doi.org/10.1080/09658211003652491

Fazio, L. K., & Marsh, E. J. (2009). Surprising feedback improves later memory. *Psychonomic Bulletin & Review*, *16*(1), 88-92. https://doi.org/10.3758/PBR.16.1.88

Filipowicz, A., Valadao, D., Anderson, B., & Danckert, J. (2018). Rejecting outliers: Surprising changes do not always improve belief updating. *Decision*, *5*(3), 165–176. https://doi.org/10.1037/dec0000073

Grant, A. F. (2021). The Armchair Quarterback and the Impostor. In *Think Again: The Power of Knowing What You Don't Know*. Penguin Publishing Group.

Gollwitzer, A., & Oettingen, G. (2019). Paradoxical knowing: A shortcut to knowledge and its antisocial correlates. *Social Psychology*, *50*(3), 145-161. https://doi.org/10.1027/18649335/a000368

Gollwitzer, A., Olcaysoy Okten, I., Pizarro, A.O., & Oettingen, G. (in press). Discordant Knowing: A social cognitive structure underlying fanaticism. *Journal of Experimental Psychology: General*.

Gunther, R., Beck, P. A., & Nisbet, E. C. (2018). Fake news did have a significant impact on the vote in the 2016 election: Original full-length version with methodological appendix. *Unpublished manuscript, Ohio State University, Columbus, OH.*

Jianing Li, Michael W Wagner, The Value of Not Knowing: Partisan Cue-Taking and Belief Updating of the Uninformed, the Ambiguous, and the Misinformed, *Journal of Communication*, Volume 70, Issue 5, October 2020, Pages 646–669, https://doi.org/10.1093/joc/jqaa022

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, *129*(3), 339. https://doi.org/10.1037/0033-2909.129.3.339

Lewandowsky, S., Ecker, U. K., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and Its Correction: Continued Influence and Successful Debiasing. *Psychological Science in the Public Interest*, *13*(3), 106-131. https://doi.org/10.1177/1529100612451018

Metcalfe, J. (2017). Learning from errors. *Annual Review of Psychology*, 68, 465-489. https://doi.org/10.1146/annurev-psych-010416-044022

Mitzen, J., & Schweller, R. L. (2009). Misplaced certainty and the onset of war. *APSA Toronto Meeting Paper*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1449304

Olcaysoy Okten, I., Gollwitzer, A., & Oettingen, G. (2022). When knowledge is blinding: The dangers of being certain about the future during uncertain societal events. *Personality and Individual Differences.*

Pashler, H., Cepeda, N. J., Wixted, J. T., & Rohrer, D. (2005). When does feedback facilitate learning of words? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *31*, 3-8. https://doi.org/10.1037/0278-7393.31.1.3

Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe-Crowne Social Desirability Scale. *Journal of Clinical Psychology*, *38*(1), 119-125. https://doi.org/10.1002/1097-4679(198201)38:1<119::AID-JCLP2270380118>3.0.CO;2-I

Rollwage, M., Loosen, A., Hauser, T. U., Moran, R., Dolan, R. J., & Fleming, S. M. (2020). Confidence drives a neural confirmation bias. *Nature Communications*, *11*(1), 1-11.

https://doi.org/10.1038/s41467-020-16278-6

Sinclair, A. H., Stanley, M. L., & Seli, P. (2020). Closed-minded cognition: Right-wing authoritarianism is negatively related to belief updating following prediction error. *Psychonomic Bulletin & Review, 27*(6), 1348-1361. https://doi.org/10.3758/s13423-020-01767-y

Southwell, B. G., & Thorson, E. A. (2015). The prevalence, consequence, and remedy of misinformation in mass media systems. *Journal of Communication, 65*(4), 589-595. https://doi.org/10.1111/jcom.12168

Stanovich, K. E., & West, R. F. (1997). Reasoning independently of prior belief and individual differences in actively open-minded thinking. *Journal of Educational Psychology, 89*(2), 342–357. https://doi.org/10.1037/0022-0663.89.2.342

Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *The Quarterly Journal of Economics, 106*, 1039-1061. https://doi.org/10.2307/2937956

Watabe-Uchida, M., Eshel, N., & Uchida, N. (2017). Neural circuitry of reward prediction error. *Annual Review of Neuroscience, 40*, 373-394. https://doi.org/10.1146/annurev-neuro-072116-031109

Walter, N., Ball-Rokeach, S. J., Xu, Y., & Broad, G. M. (2018). Communication ecologies: Analyzing adoption of false beliefs in an information-rich environment. *Science Communication, 40*(5), 650-668. https://doi.org/10.1177/1075547018793427

Zakrisson, I. (2005). Construction of a short version of the Right-Wing Authoritarianism (RWA) scale. *Personality and Individual Differences, 39*(5), 863-872. https://doi.org/10.1016/j.paid.2005.02.026

Supplemental Analyses

As we excluded those long-time responses that took more than 9 seconds from our data analysis, we got consistent findings as previous analyses that also supported our hypothesis. Paradoxical knowing still showed significant negative correlation with belief updating (r = -.354, p < .001; See Table S1). Right-wing authoritarianism was negatively correlated with belief updating (r = -.286, p < .001), which was still consistent with Sinclair et al.'s finding. Concordant knowing predicted more belief updating (r = .182, p = .007). Paradoxical not knowing did not show a significant correlation with belief updating (r = -.067, p = .321), while believing in unknowable had a significant negative correlation with belief updating (r = -.199, p = .003). Political conservatism showed a significant negative correlation with belief updating as well (r = -.309 p < .001).

Descriptive Statistics and Correlations Among Individual Difference Measures (After Eliminating Responses Faster than 9 seconds in the Feedback Learning Task)

Variable	*M*	*SD*	2	3	4	5	6	7	8
1. Belief Updating	.66	.33	-.354***	-.286***	.182**	-.067	-.199**	-.309***	-.121
			[-.473, -.227]	[-.395, -.173]	[.037, .328]	[-.200, .071]	[-.327, -.063]	[-.429, -.189]	[-.263, .010]
2. Misplaced Certainty	3.89	1.81	-	.529***	-.012	.173**	.578***	.284***	.085
				[.411, .634]	[-.161, .139]	[.014, .318]	[.462, .687]	[.159, .401]	[-.062, .239]
3. Right-wing	3.97	1.86		-	-.239***	-.181**	.297***	.399***	.199**
Authoritarianism					[-.374, -.083]	[-.336, -.025]	[.135, .447]	[.293, .494]	[.046, .340]
4. Well-placed Certainty	5.36	1.28			-	.308***	.148*	-.208**	-.112
						[.154, .464s]	[-.010, .324s]	[-.353, -.069]	[-.257, .033]
5. Misplaced Uncertainty	4.63	1.69				-	.333***	.067	-.023
							[.183, .487]	[-.067, .190]	[-.159, .111]
6. Well-placed Uncertainty	4.46	1.71					-	.183**	.089
								[.041, .304]	[-.049, .232]
7. Political conservatism	4.29	2.28						-	.029
									[-.097, .158]
8. Social Desirability	.47	.22							-

Note. 95% confidence intervals were calculated through bootstrapping and provided in brackets. *p < .05, **p < .01, ***p < .001

Table S1

Linear Regression Estimates for the Effect of Paradoxical Knowing on Belief Updating

				95.0% Confidence Interval for B	
Predictors	**Standardized Coefficient Beta**	***t***	**Sig.**	**Lower Bound**	**Upper Bound**
(Constant)		-.419	.676	-.148	.096
Paradoxical knowing	-.262	-3.068	.002	-.426	-.093
RWA	-.032	-.399	.691	-.186	.123
Concordant knowing	.131	1.965	.051	.000	.259
Political conservatism	-.189	-2.740	.007	-.323	-.053
Believing in unknowable	-.010	-.124	.902	-.158	.139
Social Desirability	-.077	-1.209	.228	-.200	.048

Note. RWA = Right-wing authoritarianism; CI = confidence level

Table S2

As expected, paradoxical knowing still explained a significant amount of variance (p = .002) in the negative direction, over and above other control variables in predicting belief updating (See Table S2). Political conservatism also predicted lower belief updating (p = .007). Right-wing authoritarianism, believing in the unknowable, and social desirability did not predict belief updating in this model.

Supplemental Material

Appendix A

Stimuli: General Knowledge Questions

Test Item	Answer
You must wait 24 hours before filing a missing person report with the police.	False
Gum remains in the stomach for 7 years before being fully digested.	False
Thomas Edison invented the lightbulb.	False
During the Salem Witch Trials, alleged witches were burned at the stake.	False
Eating before swimming increases the risk of cramps.	False
Adding salt to a pot of water makes it boil faster.	False
The Great Wall of China is visible from space.	False
Alcohol kills brain cells.	False
Different parts of your tongue are specialized for different tastes (sweet, salty, bitter, etc.)	False
Humans only use approximately 10% of their brains.	False
Most body heat is lost through the top of the head.	False
Waking a sleepwalker is bad for their health. Bananas grow on palm trees.	False
Milk increases mucus.	False
Bats use echolocation because they are blind.	False
Goldfish have a memory span of 3-seconds.	False
Shaving hair makes it grow back thicker and darker.	False
Vikings wore horned helmets.	False

Supplemental Material

Stimuli: General Knowledge Questions

Test Item	Answer
Hair and fingernails continue growing after death.	False
Adding oil to pasta prevents it from sticking together.	False
On average, a person swallows 8 spiders per year in their sleep.	False
When the Pilgrims arrived in America, they first landed at Plymouth Rock.	False
Historically, ninjas wore all-black uniforms.	False
Lightning never strikes the same place twice.	False
Meteors catch fire because of the friction from entering Earth's atmosphere.	False
A penny dropped from the top of a skyscraper could kill a person below.	False
The North Star is the brightest star in the sky.	False
Personalities are influenced by whether a person left-brain or right-brain dominant.	False
Daddy long-legs spiders have deadly venom, but their fangs are too short to pierce human skin.	False
Deoxygenated blood in your veins is blue.	False
Dogs see in black-and-white.	False
Camels store water in their humps.	False
Cracking your knuckles increases the risk of arthritis.	False
Dogs drool instead of sweating.	False

Supplemental Material

Stimuli: General Knowledge Questions

Test Item	Answer
Albert Einstein failed math in grade school.	False
Caffeine dehydrates the body.	False
Chameleons change color to match the object or surface they are touching.	False
Over time, radiation from microwave ovens can increase the risk of cancer.	False
The capital of Australia is Sydney.	False
A Geiger Counter is used to detect radiation.	True
Spinach is high in iron.	True
The giraffe is the tallest mammal.	True
The chemical formula for water is H_2O.	True
The Harry Potter book series is the best-selling series of all time.	True
Spiders have eight legs.	True
Celery is a negative-calorie food because it takes more energy to digest than it provides.	True
Blue whales are mammals.	True
The cheetah can run faster than any other animal.	True
There are eight planets in the solar system.	True
The Declaration of Independence was signed in 1776.	True
On average, cats live longer than dogs.	True
Mixing bleach and ammonia is dangerous.	True

Supplemental Material

Stimuli: General Knowledge Questions

Test Item	Answer
On hot days, it is possible to fry an egg on a sidewalk.	True
Humans can only survive 3-4 days without water.	True
The first President of the United States of America was George Washington.	True
Sun exposure lightens hair color.	True
Citrus fruits are high in Vitamin C.	True
Washington, D.C. is the capital of the USA.	True
The USA was originally 13 British colonies.	True

Appendix B

Items of Epistemic Structures

Paradoxical knowing
I know things that one can't actually know.
I know things that can't be known.
I know things that are unknowable.

Discordant knowing
I know things where most other people would say one can't know them.
I know things that most other people would say can't be known.
I know things that most other people would say are unknowable.

Concordant knowing
I know things that one can know.
I know things that can be known.
I know things that are knowable.

Paradoxical not knowing
I don't know things that one can know.
I don't know things that can be known.
I don't know things that are knowable.

Believing about the unknowable
I believe things that one can't actually know.
I believe things that can't be known.
I believe things that are unknowable.

Psychology of Espionage: A Case Study of George Smiley

Sanjana Dixit

Department of History, New York University

George Smiley does not fit the typical depiction of a spy in both the literary and cinematographic worlds, but his character is representative of a spy in the real world, potentially making him less alluring but certainly more genuine. John le Carré's *Tinker, Tailor, Soldier, Spy* narrates Smiley's time in and out of the Circus in the midst of the Cold War. After being forced out of the Circus - a British overseas intelligence agency - due to a butchered operation, Smiley is soon rehired in secret due to a pervasive fear of a double agent working for the Soviets in the high ranking members of the secret service. In his quest to discover whomst amongst his close colleagues is operating as a mole, Smiley learns that the former head of the Circus – Control – has narrowed it down to five men: the aggressive Percy Alleline, code name *Tinker*; the confident Bill Haydon, codename *Tailor*; the dependable Roy Bland, codename *Soldier*; the impertinent Toby Esterhase, codename *Poor Man*, and George Smiley himself. As Smiley gathers intelligence, coercing information out of informants and other spies and field agents such as Ricki Tarr, as well as supporting and teaching a younger agent Peter Guillam on operations, he demonstrates his abilities as an apt spy. His mild mannered yet aggressively perceptive personality is responsible for such demonstration and separates him from spies of certain psychological characteristics that succumb to the life of double agency; such as none other than the "golden boy" Bill Haydon (Le Carré, p.116). In his childhood, background and during his life-long dedication to the service, Smiley has often struggled balancing his respective obligations: those for himself and those for country; a pervasive duality that sets up the dichotomy of the novel's narrative and of Smiley's character. In doing so, both le Carré and the director of the film adaptation, Tomas Alfredson, accurately depict the realities of espionage through the portrayal of a true spy and the struggles faced that do not often appear either on screen or in books of this universally beloved genre.

The psychology of a spy is a subject of intrigue to many who read or watch espionage material in the hopes of understanding what it might take to be in that position. Espionage itself is a complex field that deals with the whole architecture of the soul, specifically the manipulation of people. It is defined as knowingly and willfully communicating, furnishing, transmitting, or otherwise making any classified information available to an unauthorized person, or publishing or using it in any manner prejudicial to the safety or interests of the United States or for the benefit of any foreign government to the detriment of the United States. This definition does not include classified intelligence collected on behalf of the United States and in accordance with US law (*US Code Title 18* (Crimes and Criminal Procedure), Part I (Crimes), Chapter 37 (Espionage and Censorship), § 798). Many people who eventually join an intelligence or espionage agency possess a "Hero Complex", or even a "James Bond Complex"(Hoffman, p.38), referring to a pervasive personality trait that often pushes agents to do what is necessary to achieve such status in their work, and to bring meaning to a job that is fruitful but certainly not as glamorous as is often depicted to the public. It stands to reason that many individuals who join their government's secret services do so in pursuit of this preconception of the field; as a job that will provide honor, thrill, danger, and excitement. It is

highly likely that multiple psychological, contextual, political, and psychosocial factors contribute to the motivation for an individual to become a spy(Lenzenweger, 2022), but despite this there is a certain psychological predisposition and personality that is prevalent among many members of the world of espionage. Entitlement, exploitation of others without remorse, thrill seeking, self-centeredness, and general lack of empathy seem to be intrinsic traits across many individuals of the field (Alrutz et. al, 2015). Albeit similar in attributes to the rather trivial "James Bond Complex" noted previously, these personality traits of the dark triad of attributes exhibited by James Bond in the fictional world of "007" are comprised of subclinical narcissism, psychopathy, and Machiavellianism(Alrutz et. al, 2015). George Smiley, unlike many spies of this nature, is not interested in the allure or prestige of espionage, because he does not possess the mindset of "brave exemplars"(Jayawickreme & Di Stefano, p. 168), and genuinely has "no edge, [nor] wish to score: only a wish to have the truth, clear under the night sky"(Le Carré, p.298), and thus has no interest in counterespionage. *The Defense Personnel and Security Research Center* (PERSEREC) has identified six key motivations for a spy to engage in counterespionage: money, ideology, coercion, disgruntlement/revenge, ingratiation and thrills/self-importance(Charney and Irvin, p. 74); a specific and dangerous similarity to self-centered personalities pervasive in the field of espionage. A feeling of disgruntlement or the resentment or anger directed toward their country or their employer for some perceived injustice, such as a lack of recognition or inadequate appreciation, failure to achieve promotion, inadequate pay or other compensation, or any number of other perceived personal slights (Charney and Irvin, p. 74), would seem to be the case for Smiley due to his forced resignation. However, unlike many other spies he works with, including Bill Haydon, he does not possess the inherent insecurity in his ability or worth at his workplace to take the resignation as anything more than what had to be done in the given circumstances of a jeopardized operation. Due to their own deeper insecurities that tend to manifest in the "James Bond Complex" which negatively affects their esteem and self-worth, stereotypical spies are not immune to internal threats of engaging in counterespionage. Ingratiation, or the desire to please another person(Charney and Irvin, p. 74) and the feeling of excitement it brings, as well as the sense of superiority the spy derives from "putting one over" on their colleagues or their organization (Charney and Irvin, p. 74) is also a manifestation of low self esteem, something that Smiley clearly lacks. He is confident in his skills, general temperament, integral traits, and perceptive abilities, which distinguishes him from his colleagues, along with his general temperament and specific personality traits, that makes him immune to these symptoms of these character flaws.

George Smiley's childhood and work in the service has shaped him into the spy depicted in *Tinker, Tailor, Soldier, Spy*; an "unheroic, timid secret agent" (Zuniga, p.11) who initially is not the focal point of the narrative but present in the background of the first scene of the film (Tinker, Tailor, Soldier, Spy. (2011). Focus Features), unlike the rest of the members at the table of the Circus, highlighting his tendency to assimilate, a trait which aids in his occupation. As a young man, Smiley was detached from the world and experienced little to no equilibrium in his personal life (Monaghan, p. 168). He fostered an early hatred of Nazism when he experienced the book-burnings of 1937 and imprisonment of his Jewish pupil Dieter Frey (Monaghan, p. 168), which solidified his pursuit for justice and loyalty to England. Despite appearance and manner as an "obscure, assimilating, unassuming...quiet, shrewd, and perceptive... fat, short, middle aged man, [with] thinning hair, and thick spectacles" (Hoffman, p. 44-45), he does occasionally have strong reactions to one thing in particular: his ex-wife Ann. He is often "disturbed by this intrusion on his memory" (Le Carré, p.152). He uncontrollably thinks of Ann and her notorious

affairs, mostly because despite repeated betrayals, his love for Ann survives, affecting the quality of his work. He notes that "like an old illness, his anger had taken him by surprise. Ever since his retirement, he had been denying its existence, steering clear of anything that could touch it off... after a lifetime of living by his wits and his considerable memory, he had given himself full time to the profession of forgetting" (Le Carré, p.79). When he is in particularly arduous situations at work, for example when he comes face to face with Karla, a Russian spy-master, he loses control because of the situation in conjunction with his weariness and distress over Ann's infidelities (Monaghan, p.162). She makes him lose control of what he believed himself to be, leading him to become a victim to the ugly aspects of his humanity that he often tries to steer clear from. But despite this minute flaw in his character, one that if anything makes him more appealing and genuine as a person, "Smiley's name is a misnomer, he never seems to smile and always maintains a poker face" (Tinker, Tailor, Soldier, Spy. (2011). Focus Features).

George Smiley struggles with the inherent dichotomy of two aspects of his life; that of his personal and independent goals and that of the Circus's aspirations for him. In many ways, Smiley is le Carré's vessel through which he expresses his own thoughts and attitudes toward this internal conflict that many spies face. In this novel and film, however, Smiley is struggling between the notions of his "old" and "new" self. The "old" Smiley is that of the establishment, and is resolved to protect the historical integrity of the Circus; essentially "breathtakingly ordinary but consumed by duty" (Le Carré, p.79). He is upset that the glory days of England and espionage are over and now the future belongs to America, but when he returns to the Circus and is tasked to find the mole, he is determined to begin a new golden age of espionage for himself. His quest much focuses on regaining prominence for England, although le Carré has been known to mention how he despises that James Bond is portrayed in this way, as a simple servant to the Queen (Hoffman, p.52). Smiley relies on his judgment and personal philosophy to avoid being trapped between institutional policies and his own personal beliefs, but that does not prevent him from doing so –not because of his lack of conviction or will – but because the nature of a career in espionage in conjunction with his incredibly well suited personality to his trade makes this issue all the more difficult. The "new" Smiley, the one who returns to the Circus and is thrust back into the world in which he belongs, is the one who accepts the task of "cleaning the stables, to go back and forth and do whatever is necessary to protect his legacy," (Le Carré, p.78) and eventually is the one character left in charge of the Circus once the mole is uncovered. This version of Smiley promotes his humanitarian credo and makes the decision to stay separated from Ann instead of crawling back and embraced his alienation therein rejecting Ann as a symbol of dependence (Zuniga, p.23). He is aware of the sacrifice that comes with integrating his "old" and "new" self to become the version of himself tasked to handle the job he has undertaken, and imparts the wisdom that in the world of espionage "There is a price to pay, and the price does tend to be oneself" (Le Carré, p.210). Although torn between the past and the future, Smiley becomes the spy in charge of discovering the mole, allowing him the opportunity to become a representation of the Circus and a model for future spies.

As mentioned exclusively by George Smiley, Bill Haydon is "probably heroic" (Le Carré, p.161), which demonstrates not only Haydon's susceptibility to counterespionage and Smiley's immunity to it, but Smiley's acute perceptiveness among other traits that separates him into a good spy and Haydon into a bad one. MICE - Money, Ideology, Compromise, and Ego (Charney and Irvin, pp.72-73) - an often cited acronym and explanation of espionage, is a situational-dispositional model that acknowledges that "espionage agents and heroic patriots may share similar personal characteristics" (Charney and Irvin, p. 75) and seeks to match the unique individual and environmental factors that combine

to create the possibility of espionage. Haydon, as part of his characterization as heroic by Smiley, has a pervasive and obvious ego, which is defined by PERESEC as a "spy's desire for challenge, adventure, and excitement" (Charney and Irvin, p. 73), as well as deep insecurity perhaps of his position and intellect in comparison to his other colleagues that ultimately manifests in narcissism. In successfully operating as a double-agent until Smiley discovers him, Haydon is overtly proud of his ability to fool the entire British secret service, as well as all of his colleagues he covertly believes to be of superior intelligence, and this pride is obvious to none other than Smiley. Due to his deeper insecurity of not having the intelligence of a spy, or more specifically one such as Smiley, Haydon over projects his success because he feels as though this achievement is disingenuous to his true intellectual ability of which only he is aware. Project SLAMMER "was envisioned as a counterintelligence initiative that aimed at deriving a better understanding of how to deter espionage.... suggested that agents self-justify their activity and view it in isolation from it's consequences" (Sheppard, p.3), which clearly illustrates that Smiley does not do that and in fact Haydon does. This self-justification is a product of a deeper insecurity, as individuals with low self-esteem feel inferior, unworthy, lonely, insecure, anxious and depressed, uncertain about themselves, and particularly challenged to succeed, interpreting events and feedback in terms of what they indicate about themselves (Liang et. al 2016). Based on the Self-Affirmation Theory, when people feel uncertain in one domain, they compensate for this by "spontaneously emphasizing certainty and conviction about unrelated attitudes, values, personal goals, and identifications" (McGregor et. al, 2001), and this compensatory conviction separates Haydon from Smiley and demonstrates his increased susceptibility to corruption, which he does in fact succumb to. Smiley perceives Haydon to have "the slow-burning skills of the natural agent runner; his rare sense of balance in the playing back of double agents and the mounting of deception operations; his art of fostering affection, even love, though it ran against the grain of other loyalties" (Le Carré, p. 161) as well as Haydon's ultimate trick to "use [his colleagues], to live through them to complete himself, here a piece, there a piece, from their passive identities ... finally submerging this dependence beneath an artist's arrogance, calling them creatures of his mind" (Le Carré, p. 162). This keen understanding of Haydon's psychology separates Smiley from his colleagues, as he is able to detect and understand the architecture of a soul like no other, and thus can expertly partake in his role as an agent of espionage aptly.

George Smiley is without a doubt one of most realistic depictions of a spy in literature and cinema, which makes him such a good spy. He is described by le Carré as "breathtakingly ordinary but consumed by duty" (Le Carré, p.79). He has a close interdependence of feeling and reason in his concept of self (Schlegel et. al, 2009), taking his feelings about a moment as his only reality, bringing his rational faculty into play, and his reason enables him to transform the emotion into ethical principle (Monaghan, pp. 168-169). He knowingly intellectualizes his emotions instead of feeling them (Oathes & Ray, 2008) but cannot prevent himself from doing so, and is thus dissatisfied. Such behavior is a clear indication of dissociation, which is theorized to stem from avoiding emotional information, especially negative emotion (Oathes & Ray, 2008). This is a product of his relationship with Ann, a tumultuous one that has emotionally and psychologically scarred him, and he can not prevent it from rising in situations of high duress, as evident in his description of his meeting with the intimidating Karla when he was younger. Despite this environmental impact on his emotional strength, his intellect and composure has remained strong, a coping mechanism often ignited in adults in order to maintain success in their career or whatever aspect of their life which is integral to their being (Diehl et. al, 2014), and in the case study of Smiley that remains to be and always will be his dedication to the world of espionage. He sets himself against moral

absolutists and enemies of individualism, and hates communism mainly due to its focus on the mass instead of the individual (Monaghan, p.169), something that sets him apart from Haydon, whose political ideologies act as one of his many motivations to perform counterespionage. The only way Smiley reconciles the end to the means is to distort the reality of the situation in which is he placed, and he refuses to do it,instead coming to terms with the moral implications of his acts (Monaghan, p.169). His internal struggle, if anything, heightens his ability to do his job well, as from it he has developed "that art, from miles and miles of secret life, of listening at the front of his mind; of letting primary incidents unroll directly before him while another, quite separate faculty wrestled with their historical connection" (Le Carré, p.108). His quiet and unassuming portrayal masks his emotional and intellectual depth, and the fierceness of his passion for the truth and the superb mental faculties he possesses in order to do so. His loyalty and inability to sustain hatred toward those who have betrayed him, especially Haydon not just in his work life but in his personal life, leads his to resolve to act, despite serious reservations about the consequences of his actions, makes him a good spy and Haydon ultimately a bad one (Zuniga, p.29). At the end of *Tinker*, *Tailor*, *Soldier*, *Spy*, George Smiley remains true to himself and his newfound combination of his "old" and "new" self, which allows him to stay vulnerable yet genuine in the convoluted world of espionage - making him the most emotionally and intellectually equipped to achieve greatness at his reassignment as Control, the head of the Circus, and the missions that he will see there.

References:

Alrutz, A. S., Kool, B., Robinson, T., Moyes, S., Huggard, P., Hoare, K., & Arroll, B. (2015, December 14). *The psychopathology of James Bond and its implications for the revision of the DSM-(00)7*. The Medical Journal of Australia. https://www.mja.com.au/journal/2015/203/11/psychopathology-james-bond-and-its-implications-revision-dsm-007

Carré Le John. (2020). *Tinker, Tailor, Soldier, Spy*. Penguin

Charney, D. L., & Irvin, J. A. (2016). Psychology of Espionage. *AFIO's The Intelligencer, Journal of U.S. Intelligence Studies*, *22*(1).

Diehl, M., Chui, H., Hay, E. L., Lumley, M. A., Grühn, D., & Labouvie-Vief, G. (2014). Change in coping and defense mechanisms across adulthood: longitudinal findings in a European American sample. *Developmental psychology*, *50*(2), 634–648. https://doi.org/10.1037/a0033619

Hoffman, T. (2002). *Le Carré's landscape*. McGill-Queen's University Press.

Jayawickreme, E., & Di Stefano, P. (2012). How Can We Study Heroism? Integrating Persons, Situations and Communities. *Political Psychology*, *33*(1), 165–178. http://www.jstor.org/stable/41407026

Lenzenweger, M. F., & Shaw, E. D. (2022). (n.d.). *The Critical Pathway to Insider Risk Model: Brief Overview and Future Directions. Counter-Insider Threat Research and Practice*, *1(1)*https://citrap.scholasticahq.com/article/36186

Liang, Y., Liu, L., Tan, X., Huang, Z., Dang, J., & Zheng, W. (2016). The Effect of Self-Esteem on Corrupt Intention: The Mediating Role of Materialism. *Frontiers in psychology*, *7*, 1063. https://doi.org/10.3389/fpsyg.2016.01063

McGregor I., Zanna M. P., Holmes J. G., Spencer S. J. (2001). Compensatory conviction in the face of personal uncertainty: going to extremes and being oneself. *J. Pers. Soc. Psychol.* 80 472–488. 10.1037/0022-3514.80.3.472

Monaghan, D. (1987). *Smiley's circus: A guide to the secret world of John Le Carré*. Totem Books.

Oathes, D. J., & Ray, W. J. (2008). Dissociative tendencies and facilitated emotional processing. *Emotion (Washington, D.C.)*, *8*(5), 653–661. https://doi.org/10.1037/a0013442

Schlegel, R. J., Hicks, J. A., Arndt, J., & King, L. A. (2009). Thine own self: true self-concept accessibility and meaning in life. *Journal of personality and social psychology*, *96*(2), 473–490. https://doi.org/10.1037/a0014060

Sheppard, J. A. (2019). Reconsidering the Role of Motivation in HUMINT. *American Intelligence Journal*, *36*(1), 6–12. https://www.jstor.org/stable/27066332

Tinker, Tailor, Soldier, Spy. (2011). *Focus Features*.

US Code Title 18 (Crimes and Criminal Procedure), Part I (Crimes), Chapter 37 (Espionage and Censorship), § 798)

Language Development in Infants and Children Born Prematurely

Abby Freeman

New York University

Abstract

Nearly 15 million infants are born prematurely each year, creating a significant amount of concern for the risk factors related to prematurity (World Health Organization [WHO]). One such risk includes a range of cognitive impairments that have been associated with preterm birth including, in particular, language impairments and delays (Bhutta, et al., 2002; Lee et al., 2011). This paper explores several theories regarding the causes of these impairments, including contributions from neurological development, attentional capacity, and environmental influences. This overview of the literature regarding the link between prematurity and struggles with language acquisition sets the stage for future research to explore interventions and the broader implications for language development.

Introduction

Each year in the US, roughly 1 in 10 infants are born prematurely, with the global total of preterm infants reaching approximately 15 million each year. The majority of these babies are born in the time frame considered moderate to late preterm (32-37 weeks gestational age), while about 16.4% are considered very preterm (28-32 weeks GA) or extremely preterm (<28 weeks GA) (Purisch & Gyamfi-Bannerman, 2017; WHO). These numbers are certainly cause for concern as prematurity, particularly for those born very or extremely prematurely, are at risk for many health complications both in infancy and later on in their development. Prematurity has been linked to complications such as respiratory and cardiovascular issues as well as an increased risk of cerebral palsy, epilepsy, and more (Doyle, 2008; Eunson, 2012; Li et al., 2019). Some other complications related to preterm birth may not be seen until later in development, such as cognitive and behavioral impairments including low IQ, ADHD, and, in particular, language impairments (Bhutta, et al., 2002; Lee et al., 2011). The process of language acquisition is complex and still has many unanswered questions. However, one way to shed light on this process is to investigate the origin or causes of deficits when they occur. Understanding the link between preterm birth and language impairments could lead to the development of interventions and therapies to help those born prematurely and, on a broader level, provide more information about the process of language development overall.

Impairments

Preterm infants begin showing behaviors, even preverbally, that are often not present in their full term counterparts of the same chronological age. One such example is seen in the common still face experiment in which an experimenter interacts with a baby and suddenly makes a still, blank face. Infants often become upset and try to encourage the experimenter to re-engage (Adamson & Frick, 2009). At 6 months, preterm participants were less likely to make engagement attempts with the experimenter and at 9 months, they were less likely to follow an experimenter's gaze compared to controls (De Schuymer, et al., 2011). This suggests a delay in joint attention ability, or "the ability to

coordinate visual attention with others regarding objects and events" (Mundy & Gomes, 1998). Joint attention is a skill that is theorized to be an important scaffolding step in language development, potentially because these interactive episodes allow infants to establish a connection between the adult's referential language and the object of their attention (Tomasello & Farrar, 1986). Another critical aspect of early language acquisition is fine-tuning to one's first language. One way infants do so is through perceptual narrowing, in which they become better at distinguishing phonemes in their native language, and worse at distinguishing others (Maurer & Werker, 2013). At 12 months, most preterm infants do not show this skill at the same level as their full term counterparts. Further, those that had not shown perceptual narrowing at 1 year performed worse on a communicative language test at 2 years (Jansson-Verkasalo et al., 2010). Overall, it appears that prematurity causes impairments in preverbal skills that are seen as preliminary steps in language development. As these individuals get older, differences between them and full term children of the same age continue to develop. In a meta-analysis of children ages 6-13, those born prematurely perform worse on tests requiring them to name written words, understand the meaning of sentences, and have an opinion on them (Kovachy, 2014). In other words, their decoding and reading comprehension skills were impaired. This suggests that problems occur at both the more basic levels of language development, such as phonemic awareness, as well as the higher level abilities of semantics and pragmatics. Further, at 4 years of age, preterm children show language deficits both on standardized tests and samples taken of them having casual conversations (Imgrund, Loeb, & Barlow, 2019). Interestingly, a very similar study done with children ages 7-10 found the same difference in standardized test scores but did not find this difference between the two groups when analyzing a casual conversation (Smith, 2014). These findings suggest a possibility that prematurity only leads to a delay in language development, as opposed to an overall lapse in linguistic ability. Now understanding the context of what these impairments include, their potential causes should be examined as well.

Neurological Influence

Even towards the end of the gestational period, the fetus is still undergoing a large amount of neurological development. For example, myelinated white matter in the central nervous system undergoes a 5-fold increase in volume between the 34th and 41st week of gestation (Moossavi & Panahi, 2017). Myelination, or the process of neural axons becoming encased in fatty myelin sheath, allows for rapid interneuronal communication and is thus thought to be the basis for normal cortical functioning. Further, abnormal myelination is considered to cause reduced brain connectivity and, consequently, cognitive and behavioral impairments (Deoni et al., 2012; O'Muircheartaigh et al., 2013; Batalle et al., 2017). Since much of this process occurs towards the end of gestation, those born preterm are at risk for abnormal neural development, particularly in regards to myelination (Thompson & Nelson, 2001). Recent studies have supported the idea of a connection between abnormal myelination and language deficits. Pujol et al. 2006 demonstrated that children did not seem to begin their typical vocabulary "growth spurt" until a certain level of myelination had been achieved at around 18 months. Caution should be taken when considering these results as they are correlational and, of course, vocabulary is not a particularly effective way to measure overall language ability. However, these patterns have also been observed with older children using standardized tests of receptive and expressive language designed to identify language disorders. 3 year olds that had abnormal myelination in the auditory pathway, on average, performed worse on these tests (Amin, et al., 2014). Overall, research points to the idea that these language deficits might stem from abnormal neurological development when a baby is born before language and auditory areas finish fully

developing. However, there are also many non-neurological theories as to the relationship between prematurity and language impairments.

Attentional Influence

It is well understood that prematurity can lead to other cognitive impairments besides language. One common issue is attention deficits, with extremely premature children being four times more likely to have ADHD than their full term counterparts (Shea, Downey, & Kuban, 2013). Additionally, there is often a high comorbidity of language difficulties and ADHD even in full term individuals (Mueller & Tomblin, 2014). This raises an interesting possibility that attention difficulties are related to their struggles with language. School-age children born at or before 32 weeks are more likely to show attention deficits (even if they do not have a formal ADHD diagnosis), which is correlated with worse performance on language tests. Their attention rating significantly predicts their scores on these exams, accounting for 15% - 20% of the variance in their scores (Mahurin-Smith, DeThorne, & Petrill 2017). One longitudinal study measured the performance of premature infants between the ages of 18 and 36 months. Their language skills at 18 months did not predict their attention ratings at the end of the study, but their attention did significantly predict their language skills throughout the study (Ribeiro, 2011). Many theorize that attentional ability is crucial to language learning, as it allows you to selectively attend to and ignore elements of language as you read or listen to it (Diego-Balaguer, Martinez-Alvarez, & Pons, 2016). There are many models for human development within the psychological community, however it is commonly accepted that both nature and nurture play a role (Collins, et al. 2000). Therefore, in order to comprehensively examine the issue of language deficits, the difference in the neonatal environments of premature infants and their full term counterparts must be taken into consideration.

Environmental Influence

Growing amounts of research raise concerns over the setting premature babies enter immediately after birth: the Neonatal Intensive Care Unit (NICU). When a fetus is in-utero, the sounds they hear are mostly low frequencies that are somewhat muffled by the uterine lining and amniotic fluid. This environment protects the auditory nervous system during a very sensitive time in its development (Graven & Browne, 2008). This is drastically different from the NICU, in which the baby is exposed to the many loud, high frequency sounds of medical machinery. As previously discussed, a baby born prematurely has not finished developing these systems at the time of their birth, and this "acoustic trauma" may disrupt the neural organization of these pathways. This could potentially lead to disruption in hearing and, subsequently, language abilities (Lahav & Skoe, 2014). As always, the debate of nature vs. nurture is not easy to settle and it is possible that language impairment in premature individuals is the result of a complicated mix of both. Regardless, the next logical step is to figure out how to help.

Discussion and Interventions

One of the easiest changes to make is the postnatal environment. As discussed, the acoustic trauma of the NICU poses a large problem. A large concern is the lack of maternal sounds (heartbeat, respiration, voice, etc.) that they would have been hearing for longer if they were born at 40 weeks. To combat the effect of this while the infant is in an incubator, recordings of their mother's voice or soft music could be played, in order to provide appropriate linguistic stimulation (McMahon, Wintermark, & Lahav, 2012). There are many early behavioral interventions that could help as well. In one study, the effectiveness of family nurture intervention (FNI) in the NICU was studied. This referred to activities that mothers were instructed to do with their infants, including making as much eye contact as possible,

speaking to the baby about feelings in their native language, and gentle touch. At 18 months chronological age, the infants with mothers that received FNI at the NICU scored higher on language and attention tests, compared to those who did not (Welch, et al., 2015). This lends credence to the importance of the environment immediately post-birth for preterm infants' language and general auditory development.

Conclusion

Researchers have repeatedly demonstrated a link between prematurity and language impairments, delays, or disorders. There is, of course, still dispute over what these impairments may include or how long they last, but the consensus in the literature seems to be that these are issues we need to watch out for in preterm infants and children. There are many potential causes, from abnormal neural development to the high comorbidity with other cognitive disorders. It should also be recognized that research is limited by the fact that it is often difficult to disentangle the origin of these causes and avoid drawing causality from correlation. Regardless of the origin of these impairments, future research could benefit these children by focusing on what behavioral interventions are most helpful and identifying early warning signs for others around them to watch for. However, while studies can investigate helpful interventions they are still based on generalizations of a study sample. Of course, not every child is the same and therefore individualized considerations should be taken when planning treatment. Overall, there is still much to be discovered about the complex relationship between language development and prematurity and how to best help these children.

References:

Adamson, L.B. & Frick, J.E. (2009). The Still Face: A History of Shared Experimental Paradigm. *Infancy, 4*(4), 451-473.

Amin, S.B, Vogler-Elias, D., Orlando, M., & Wang H. (2014). Auditory neural myelination is associated with early childhood language development in premature infants. *Early Human Development, 90*(10), 673-678.

Barde, L. H. F., Yeatman, J. D., Lee, E. S., Glover, G., & Feldman, H.M. (2012). Differences in neural activation between preterm and full term born adolescents on a sentence comprehension task: Implications for educational accommodations. *Developmental Cognitive Neuroscience, 2*(1), 114-128.

Batalle, D., Hughes, E. J., Zhang, H., Tournier, J. D., Tudor, N., Aljabar, P., Wali, L., Alexander, D. C., Hajnal, J. V., Nosarti, C., Edwards, A. D., & Counsell, S. J. (2017). Early development of structural networks and the impact of prematurity on brain connectivity. *NeuroImage, 149*, 379-392.

Bhutta, A. T., Cleves, M. A., Casey, P. H., Cradock, M. M., & Anand, K. J. S. (2002). Cognitive and Behavioral Outcomes of School-Aged Children Who Were Born Preterm. *JAMA, 288*(6), 728-737.

Collins, A.W., Maccoby, E. E..,Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist, 55*(2), 218-232.

Deoni, S. C. L., Dean, D. C., O'Muircheartaigh, J., Dirks, H., & Jerskey, B. A. (2012). Investigating white matter development in infancy and early childhood using myelin water faction and relaxation time mapping. *Neuroimage, 63*(3), 1038-1053.

De Schuymer, L., De Groote, I., Beyers, W., Striano, T., & Roeyers, H. (2011). Preverbal skills as mediators for language outcome in preterm and full term children. *Early Human Development, 87*(4), 265-272.

Diego-Balaguer, R., Martinez-Alvarez, A., & Pons, F. (2016) Temporal Attention as a Scaffold for Language Development. *Frontiers in Psychology, 7*(44).

Doyle, L. W. (2008). Cardiopulmonary Outcomes of Extreme Prematurity. *Seminars in Perinatology, 32*(1), 28-34.

Eunson, P. (2012). Aetiology and epidemiology of cerebral palsy. *Paediatrics and Child Health, 22*(9), 361-366.

Graven, S.N. & Browne, J.V. (2008). Auditory Development in the Fetus and Infant. *Newborn a nd Infant Nursing Reviews 8*(4), 187-193.

Imgrund, C. M., Loeb, D. L., & Barlow, S. M. (2019). Expressive Language in Preschoolers Born Preterm: Results of Language Sample Analysis and Standardized Assessment. *Journal of Speech, Language, and Hearing Research, 62*, 884–895.

Jansson-Verkasalo, E., Ruusuvirta, T., Huotilainen, M., Alku, P., Kushnerenko, E., Suominen, K., Rytky, S., Luotonen, M., Kaukola, T., Tolonen, U., &

Hallman, M. (2010). Atypical perceptual narrowing in prematurely born infants is associated with compromised language acquisition at 2 years of age. *BMC Neuroscience, 11*(88).

Kovachy, V. N., Adams, J. N., Tamaresis, J. S. (2014). Reading abilities in school-aged preterm children: a review and meta-analysis. *Developmental Medicine and Child Neurology.*

Lahav, A. & Skoe, E. (2014). An acoustic gap between the NICU and womb: a potential risk for compromised neuroplasticity of the auditory system in preterm infants. *Frontiers in Neuroscience, 8*, 381.

Lee, E. S., Yeatman, J. D., Luna, B., & Feldman, H. M. (2011). Specific language and reading skills in school-aged children and adolescents are associated with prematurity after controlling for IQ. *Neuropsychologia, 49*(5), 906-913.

Li, W., Peng, A., Deng, S., Lai, W., Qiu, X., Zhang, L., & Chen, L. (2019). *Epilepsy and Behavior, 97*, 83-91.

Mahurin-Smith, DeThorne, & Petrill. (2017). Longitudinal Associations Across Prematurity, Attention, and Language in School-Age Children. *Journal of Speech, Language, and Hearing Research, 60*, 3601–3608.

Maurer, D. & Werker, J.F. (2013). Perceptual narrowing during infancy: A comparison of language and faces. *Developmental Psychobiology 56*(2), 154-178.

McMahon, E., Wintermark, P., & Lahav, A. (2012). Auditory brain development in premature infants: the importance of early experience. *The Neurosciences and Music IV: Learning and Memory*, 17-24.

Moossavi A, Panahi R. (2017). The effects of preterm birth on neural development, language acquisition, and auditory system. *Auditory and Vestibular Research, 26*(3) 117-124.

Mueller, K.L. & Tomblin, J.B. (2012). Examining the comorbidity of language disorders and ADHD. *Top Lang Discord 32*(3), 228-246.

Mundy, P. & Gomes, A. (1998). Individual differences in joint attention skill development in the second year. *Infant Behavior and Development, 21*(3), 469-482.

O'Muircheartaigh, J., Dean, C. D., Dirks, H., Waskiewicz, N., Lehman, K., Jerskey, B. A., & Deoni, S.C.L. (2013). Interactions between White Matter Asymmetry and Language during Neurodevelopment. *The Journal of Neuroscience, 33*(41), 16170-16177.

O'Shea, T.M., Downey, L.C., & Kuban, K.K.C. (2013). Extreme prematurity and attention deficit: epidemiology and prevention. *Cognitive Neuroscience, 7*(578).

Pujol, J., Soriano-Mas, C., Ortiz, H., Sebastián-Gallés, N., Losilla, J. M., & Deus, J. (2006). Myelination of the language-related areas in the developing brain. *Neurology, 66*, 339-343.

Purisch, S. E. & Gyamfi-Bannerman, C. (2017). Epidemiology of preterm birth. *Seminars in Perinatology, 41*(7), 387-391.

Ribeiro, L., Zachrisson, H., & Schjolberg, S. (2011). Attention problems and language development in preterm low-birth-weight children: Crosslagged relations from 18 to 36 months. *BMC Pediatrics, 11*(59).

Smith, J.M., DeThorne, L.S., Logan, J. A. R., Channell, R.W., & Petrell, S. A. (2014). Impact of Prematurity on Language Skills at School Age. *Journal of Speech, Language, and Hearing Research, 57*, 901-910.

Thompson, R. A. & Nelson, C. A. (2001). Developmental science and the media: Early brain development. *American Psychologist, 56*(1), 5-15.

Tomasello, M. & Farrar, M.J. (1986). Joint Attention and Early Language. *Child Development 57*(6), 1454-1463.

World Health Organization. (2018, February 19). *Preterm Birth.* https://www.who.int/news-room/fact-sheets/detail/preterm-birth.

Identity-Focused Language Hinders Girl's Ability To Recover From Setbacks In Science

Ashley Winegarden

Department of Psychology, New York University

Author's Note

Ashley Winegarden is a 2022 NYU graduate with a B.A. in psychology. She has spent the last three years working in the Conceptual Development and Social Cognition Lab. During this time she has been a part of the Scientist Intervention Project, researching how children learn about science and how the language used impacts children's conceptualization of who can do science. This thesis was a continuation of that work and won best poster at NYU's undergraduate research conference. She would like to thank Dr. Marjorie Rhodes, Dr. Bob Rehder, Dr. Marissa Carrasco, Amanda Cardarelli, Michelle Wang, Alexandria Pena, and the Dean's Undergraduate Research Fund.

Abstract

Who can do science? Is it exclusively for people who fit the stereotype of scientists or is it an activity anyone can engage in? These two conceptualizations about who can do science can affect the way someone perceives themselves fitting into the field, especially children. Previous research suggests that children introduced to science with identity-focused language (e.g., "Today we're going to be scientists") are less likely to persist in science tasks than children introduced with action-focused language (e.g., "Today we're going to do science"). This is because identity-focused language elicits kinds-based representations of science, which invites children to question whether or not they are scientists (Rhodes et al., 2012). What has yet to be investigated is the qualitative responses that moderate children's persistence. This study examines if the language used to teach science to children predicts their responses to setbacks and how those responses predict their persistence in pursuing science. In this experimental design, children were introduced to science with either action or identity language before experiencing a setback. Children's verbal and nonverbal responses to the setback were coded from the video as positive, negative, or no response. There was no main effect of language condition on childrens' responses and across the entire sample, children who exhibited negative responses persisted less than those who did not. However, when looking specifically at gender and condition, only girls who heard identity-focused language were less likely to persist if they exhibited negative responses. This suggests that perhaps identity-focused language makes it more difficult for girls to recover from setbacks.

Identity-Focused Language Hinders Girls' Ability to Recover From Setbacks in Science

When you hear the word scientist, what image comes to mind? For most people, the word conjures up an image of a man, usually White, in a lab coat, perhaps holding a beaker or using a microscope (Miller et al., 2018). This image arises from society's current understanding of the stereotypical "scientist" and has real-life consequences. Despite the many significant achievements of females and racial/ethnic minorities in science, members of these groups are still drastically underrepresented in STEM fields. Women represent only 39% of those employed in physical science, 25% of those employed in computer science, and 14% of those employed in engineering (Funk & Parker, 2019). Sixty-two percent of all STEM workers in the U.S. are White, while only 9% are Black and only 7% are

Hispanic, despite making up 13.5% and 18% of the population respectively (Funk & Parker, 2019).

It is important to understand the impacts of these cultural stereotypes beginning in early childhood to reduce future inequality in STEM (Master, 2021). This disparity may be fueled by prevalent stereotypes suggesting scientists are meant to be male and White (Kiefer & Sekaquaptewa, 2007). Children are often described as gender detectives, carefully seeking out what is expected of them based on their gender (Martin and Ruble, 2004). They are exposed to our culture's stereotypes surrounding gender and science and internalize these stereotypes in their personal understanding of gender and science (Masters, 2021). According to a 2021 review of the effect of STEM stereotypes, children who belong to gender groups that are not included in STEM stereotypes were more likely to be unsure of their science abilities, which made it more difficult for them to develop an interest in science (Masters, 2021). These implicit biases remain ingrained, despite some adults' explicit beliefs that anyone can do science (Master, 2021).

These stereotypes not only lead people from underrepresented groups to believe they are not meant to be scientists; they also lead others to implicitly believe that people from underrepresented groups are not meant to be scientists. In 2019, a study examined how race and gender affect faculty perceptions of Ph.D. candidates in STEM (Eaton et al., 2019). Across multiple scientific disciplines, Black and Latinx candidates were seen as less competent and hireable than their White and Asian counterparts with the same qualifications, while female candidates were seen as more likable, yet still less hireable (Eaton et al., 2019). This hiring discrimination exemplifies the real-life damages done by these stereotypes furthering inaccessibility, and limiting diverse perspectives. These harmful stereotypes surrounding scientists are transmitted to children in early childhood (McGuire et al., 2020).

How Children Conceptualize Scientists and Science

Thirty-nine years ago, only 1% of grade-school children drew a woman when asked to draw a scientist (Chambers, 1983). While cultural attitudes towards women in STEM have shifted, there remains an implicit undercurrent suggesting scientists are primarily men. A 2018 meta-analysis of more recent draw-a-scientist studies found that while children drew women more often than in the past, they drew significantly more men than women as they grew older (Miller et al., 2018). Stereotypes associating femininity with reading and art, and masculinity with math and science, are consistent across many domains of children's media including literature, Disney movies, PBS shows, and Nickelodeon shows (Charlesworth et al., 2021). This association is present despite the fact that the majority of famous artists and authors throughout history have been male. Children are taught these stereotypes as children, which are carried over with them into adulthood, perpetuating the cycle. While nations with higher female employment levels had less explicit (conscious) male-science associations, their implicit (unconscious) male-science associations remained the same, even in nations high on the Gender Equity Scale (Miller et al., 2014).

How Science Stereotypes are Transmitted to Children

These stereotypes are easily transmitted to children, possibly because at an early age, children are exposed to language that elicits a category-based representation of science. Media targeted toward children often presents science to young children using *identity-focused language* (e.g., "Scientists explore the world"). For example, children's cartoons often have children pretend they are scientists and use this identity-focused language to present children with science activities (Wang et al., 2022). Both generic statements (e.g., "Boys play with action figures"; "Girls play with dolls ") and noun labels (e.g.,

"These dogs have short hair"; "She is a carrot-eater") have been shown to elicit essentialist beliefs (Rhodes et al., 2012). Essentialist beliefs assume that people and things have an inherent "essence" that makes them what they are (e.g., girls have a special core that makes them inherently different from boys; Rhodes et al., 2012).

Commonly used identity-focused language is often well-intentioned and meant to boost science engagement (Rhodes et al., 2019). However, the use of noun labels and generics to introduce science may lead children to conclude that people who do science (i.e., "scientists") are a *special type of person* who have a scientist essence, and children might then try to conceptualize what people in that category might look like or traits they might commonly have. This, in turn, invites them to question if they fit the category of "scientist" (Rhodes et al., 2020). In other words, identity-focused science language suggests to children that those who *look* like stereotypical scientists are the only people who have this innate quality and capacity. Because scientists are stereotyped as White and male (Kiefer & Sekaquaptewa, 2007), those fitting that description are seen as the only ones who can be scientists (Rhodes et al., 2019).

This essentialist thought process is especially harmful to groups underrepresented in science (e.g., girls and racial/ethnic minorities), who do not fit the typical prototype of a "scientist" (Lei et al., 2020; Rhodes et al., 2020). This is because identity-focused language invites children to question if they are members of the scientist category, which reduces engagement in science if they do not believe that they are included in this group (Rhodes et al., 2019). Studies have shown that when introduced to science with identity-focused language, those underrepresented in science are less likely to persist after a setback. Setbacks are an inevitable part of doing science, making the ability to persevere through them an important part of the scientific process (Rhodes et al., 2019).

Adaptive Effects of Action-Focused Science

An alternative way to describe science is to use more inclusive action-focused language of "doing science" (e.g., "Let's do science and learn about the world!"; "Doing science means learning new things about the world"!). Action-focused language avoids triggering essentialist beliefs and is shown to increase the likelihood of children from underrepresented groups to persist in science (Lei et al., 2019; Rhodes et al., 2020).

In a 2019 study, children were exposed to action- versus identity-focused language and then participated in a persistence task. During this task, girls in the action-focused condition persisted more. Meanwhile, the identity-focused language negatively impacted girls' persistence but not boys (Rhodes et al., 2019). In a 2020 field experiment, researchers exposed teachers to either action-focused language (e.g., "I like science because experimenting with stuff") or standard neutral language (control) in training videos and then recorded the language teachers used during a subsequent science lesson, as well as their students' science persistence and interest. Although identity-focused language (e.g., "You are such a great scientist") appeared to be the baseline language teachers used in the control group, those in the action-focused condition switched easily to the more inclusive action-focused language, which resulted in their students exhibiting greater science persistence and science interest later on (Rhodes et al., 2020).

Children's Confidence and How It Affects Motivation

Women's lower confidence in STEM detriments their persistence in STEM careers (Cech et al., 2011). According to previous research, children's self-efficacy (i.e., confidence in their ability to complete a certain task) also greatly affects their willingness to persist in certain tasks, especially those that they perceive to be more difficult (Zimmerman and Ringle, 1981). Identity-focused language suggests that scientists have an essence about them that makes them scientists and allows them to do science. At the same time, it

suggests to children from underrepresented groups that they are not members of the scientist group. Children may then conclude that they do not have this inherent science ability, which is key to being a scientist. Following this line of thinking, if certain groups of children believe they are inherently not meant to be scientists, then they are more likely to have lower confidence in their ability to do science (science-efficacy), which will hurt their motivation to persist. If children perceive a science task to be difficult or if they experience a setback in science, then this belief that they don't belong to the category of "scientists" could result in them disengaging from science altogether.

The Present Study

To investigate these disparities in STEM, an ongoing, longitudinal study by Rhodes et al. studied how identity- versus action-focused language affects children's willingness to persist in science-related tasks. Specifically, children were exposed to the language during at-home online science lessons across multiple sessions, which allowed us to track their persistence across time. In this study, children completed a science lesson in which they heard either action-focused language (e.g., "Today we're going to do science to learn about the world") or identity-focused language (e.g., " Today we're going to be scientists to learn about the world") while learning science concepts. They then participated in a persistence task, which measured how long they were willing to persist on a science guessing game after they experienced a setback where they received feedback that they made a wrong guess.

To delve deeper into children's choice to persist, this project intended to measure another aspect related to children's science persistence: their *confidence*, specifically how it was affected by a setback. This was done by analyzing children's responses to the setback and determining if there were differences based on linguistic input and demographics (i.e., gender and race). This study asked the question: how is the confidence of girls impacted after experiencing a setback on a task, in which they heard either action-or-identity-focused language? Specifically, do children from different demographics exhibit different patterns of verbal, behavioral, or parent referencing responses (indicative of decreased or increased confidence) after experiencing a setback? How does confidence moderate their choice to persist at a science task? By looking at whether linguistic input was able to bolster children's confidence in tandem with their persistence following a setback, this addition to the original study aimed to provide insights into why some children choose to persist following a setback.

We hypothesized that children in the action-focused condition would exhibit behaviors indicating that their confidence was not negatively affected by the setback. Assuming that they would not view "doing science" as relevant to their identity, a setback would not be detrimental to their potential success in science. Our second hypothesis was that children in the identity-focused language condition would exhibit less positive (less confident) behaviors because they would interpret this negative feedback as diagnostic, with a setback indicating that they do not belong to the category of "scientist". Within the group of children in the identity-focused language condition, we predicted that children from backgrounds that are stereotypically associated with science (i.e., male, White) would exhibit reduced confidence as it would violate their preconceived idea of themselves fitting the "scientist" stereotype. Similarly, we also predicted that children who do not fit the stereotype of scientist (i.e., girls and racial minorities) would have no response to the setback, as they would not be surprised by getting something wrong since they already do not associate themselves with the "scientist" category.

This study investigated the emotional responses moderating engagement with science after a setback to see how children's reactions amplified the effects of the language condition on girls' persistence. While the larger project that this

study builds on is comprehensive and includes many types of *quantitative methods* to understand child engagement with science, this study utilized *qualitative methods* to provide new insights into the behaviors of children during the study. There is currently little literature on how emotional reactions and confidence specifically moderate children's science persistence. This project will factor in children's reactions to feedback into an analysis of their science engagement.

Methods

Overview and Timeline

The present study was part of a larger science intervention that examined the effects of language cues (action-focused or identity-focused) on children's science beliefs and behaviors. To do so, we randomly assigned pre-kindergarten-age children to one of two language conditions – action-focused or identity-focused – and introduced them to various science concepts, including friction, gravity, buoyancy, and transparency exclusively with the type of language of their assigned condition. During the first science lesson, the one the present project focused on, children learned about friction. Following this lesson, during the same session, they participated in an embedded persistence task.

This project was conducted as an unmoderated remote experimental study; children and parents were able to complete the lesson and persistence task virtually, with no researcher interference. After obtaining parental consent and child assent, a webcam recorded the children and parents as they participated in the study at home. The videos were then uploaded to a secure server and were transcribed and analyzed by two research assistants. Strong inter-rater reliability was established between the coders ($k > 0.90$). To investigate how assigned language conditions shaped children's confidence in science following a setback, we measured children's confidence by coding interactions of parents and children, as well as child behavior, directly after receiving the negative feedback in the task and before their choice to "keep playing the science game" or to "do something else" (i.e., our measure of persistence).

Participants

Recruitment occurred online through an online lab for unmoderated remote research, PANDA (discoveriesinaction.org; Rhodes et al., 2020) by way of school partnerships, community outreach efforts, social media, and paid advertisements through Facebook and Instagram. Eligible participants included children aged four to five registered with PANDA. Of the original participants who were included for coding (n = 259), some participants were excluded (n = 48) for either computer issues (n = 35) or were randomly selected and used as coding practice to establish reliability and could therefore not be included in the final sample (n = 13). Two hundred and eleven participants were included in the final sample (N = 211; 86 male; 124 female). Based on parents' reports, participants included were African American (4.4%), Asian (6.6%), Hispanic (5.7%), White (49.7%), and mixed-race (33.6%). Although the initial goal was an even split between language conditions, due to the aforementioned exclusions, there were more participants in the action-focused condition (n = 112), than in the identity-focused condition (n = 99).

Lesson and Persistence Task

Children were randomly assigned to one of two language conditions: identity-focused, where they were taught science with language asking them to "be scientists" or action-focused, where they were taught science with language asking them to "do science". Based on their condition, children were presented with a lesson taught by Curious Cat, a fictional, animated character developed as a gender-neutral teacher (http://kidconcepts.org/curious-cat). During this lesson, children learned the basics of friction, participated in interactive activities (e.g., rubbing their hands together to test out friction), and were

taught a three-step overview of the scientific process (observe, predict, and check). These three steps framed how the children heard identity-focused or action-focused language, depending on their assigned condition. Immediately following this lesson, they participated in an embedded science persistence task. More details on the lesson and persistence task are listed on the OSF site for this project (https://osf.io/yj3zm/).

During this science persistence task, children were able to test their understanding of friction by completing a series of questions where they guessed how far a toy car would roll down a ramp covered in different textures (e.g., wood, carpet, etc.). First, children were shown a ramp with a rainbow mat at the bottom (see Figure 1) and a toy car placed at the top. The children then had the opportunity to observe the material placed on top of the ramp.

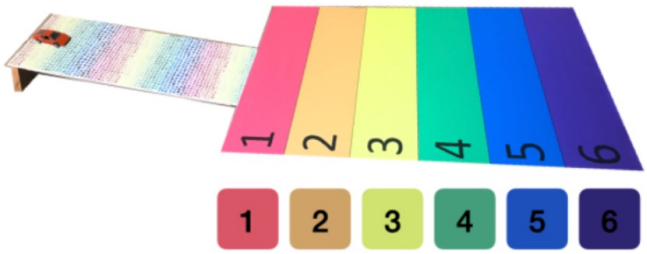

Figure 1. Example image presented to children during the persistence task of the friction lesson. Children observed the material on the ramp, then guessed how far the car would roll

.

They then predicted how far the toy car would go on the different textures (each a separate trial), to represent the friction caused by the material on the ramp. Finally, they checked their answer for the first two trials, with children first making a guess about how far the car would go on wood and then how far it would go on a playmat. Regardless of what the children answered, the feedback was designed so that they always received positive feedback that their first guess about the car on the wood was correct and then received negative feedback that their second guess about the car on the playmat was incorrect. The negative feedback children received after the second guess simulated a setback, which is an inevitable part of doing science. Following the negative feedback, no further feedback was provided on any of the remaining trials. They were then asked if they would like to "keep playing the science game" or "do something else", which was collected as a measure of their quantitative persistence after a setback.

To expand on this quantitative measure of science persistence, this project looked specifically at the video recording of the child in the few seconds *after* the child experienced the setback (i.e., got the feedback that they had guessed incorrectly) to see the children's behavioral and verbal reactions, as an additional measure and insight as to why children chose to persist or not after the setback. To analyze these reactions, a thorough scheme was developed to code for child behaviors and their interactions with their parents. Also included as part of the analysis was whether children chose to complete another question in the science persistence task, which together helped us assess how children's responses to setbacks directly shaped their science behavior and engagement.

Coding

To code the children's behavior and reactions to the setback, we created a template in Datavyu (Datavyu Team, 2014) for categorizing different types of child behaviors and interactions. Each participant's video was coded by two separate coders and compared for inter-rater reliability. However, coders watched the video of the child participating in the game from the introduction of the persistence task, in order to check if behaviors that could be coded occurred prior to the setback (e.g., behaviors that could be categorized as self-soothing or disengaged). If so, then that behavior was not coded, as it could not be attributed as a reaction to the setback. Codes were not mutually exclusive, meaning that a child could exhibit the behavior of multiple codes, such as both positive and negative behaviors (see Table 1 for examples of each code).

Child Response	Type of Response	Specific Code	Examples
Negative	Verbal	Loss of interest	"I want to stop"; "I don't want to play anymore"
		Preoccupied with feedback	"Aw man"; "I wanted to get that right"
	Behavioral	Disengaged	Looking off screen, leaving the area where the device is
		Self-soothing	Sucking their thumb, fidgeting with their hands or clothes
		Comfort and/or support from parent, initiated by child	Leaning on them, trying to sit in their lap, holding hands
		Upset	Crying or frowning or a saddened sigh
	Parental Referencing	Ambiguous towards their answer	"What do you think" or "Well, if this is true then…"
		Supportive	You're doing so good", "Almost done", or allowing child to sit on their lap
		Irritated	"Come on, you need to finish this" in an irritated tone
		Refusal to accept	"The game is wrong"; "That is the game's mistake, not yours"
Positive		Acceptance of mistakes	"That's alright"; "Mistakes happen"
		Opportunity to learn	"That makes sense because of [blank]"
		Error attributed away from self	"That's not right"; "The computer must be wrong"; "That's doesn't make sense"
		Positive affect	Smiling, laughing, and other signs they are enjoying the game despite the setback
		Confident	"I know I'm going to get this one right"
None			Child says/does nothing, exhibits no facial reaction

Table 1. Breakdown of the coding scheme for children's responses. Responses following the setback were either coded as negative, positive, or no response. Types of responses were then tagged with a specific code label, where a negative response could then be categorized as behavioral, verbal, or parental referencing, and then even more clearly as a specific code within any of those types of responses. These codes were not mutually exclusive (i.e., a child's response could be tagged as positive and negative if a child exhibited a series of reactions or could be tagged as multiple types of responses within the same category if the child exhibited verbal and parental referencing responses within the "negative" response type, for example).

Results

Descriptive Analyses

Across all conditions and demographics, children were more likely to exhibit negative behaviors (55%) than both positive behaviors (20%) and no behaviors (37%). The positive behavior that was most frequent across all groups was positive affect (91% of those who showed positive responses), while the most common negative behavior was children being upset (90% of those who showed negative behavioral responses) and parental referencing (i.e., looking to their parents; exhibited by 61% of participants who showed negative responses). Within the negative verbal codes, being preoccupied with the negative feedback (96% of those who showed verbal responses) was the most common, but still not as common as the aforementioned negative codes. Parents responded to their children's referencing approximately half of the time (53%), with the majority of responses being supportive (70% of those who showed parental responses) and ambiguous (27% of those who showed parental responses). See *Table 2* for how often each code occurred throughout the entire sample.

Child Response	Type of Response	Specific Code	% Prevalence
Negative 55% (n = 117)	Verbal 22% (n = 26)	Loss of interest	4% (n = 1)
		Preoccupied with feedback	96% (n = 25)
	Behavioral 66% (n = 79)	Disengaged	4% (n = 3)
		Self-soothing	19% (n = 15)
		Comfort and/or support from parent, initiated by child	5% (n = 4)
		Upset	90% (n = 71)
	Parental Referencing 61% (n = 72)	Ambiguous towards their answer	27% (n = 10)
		Supportive	20% (n = 26)
		Irritated	3% (n = 1)
		Refusal to accept	3% (n = 1)
Positive 20% (n = 42)		Acceptance of mistakes	28% (n = 12)
		Opportunity to learn	5% (n = 2)
		Error attributed away from self	2% (n = 1)
		Positive affect	91% (n = 39)
		Confident	0% (n = 0)
No Response			37% (n = 79)

Table 2. Breakdown of the prevalence of each code in the sample. Codes were not mutually exclusive, meaning a child's response could be coded as both positive and negative, or as both disengaged and self-soothing within the behavioral category, explaining why the percentages do not add up to 100% and the numbers do not add up to the total for each category. Children were most likely to exhibit negative responses, second-most likely to exhibit no response, and least likely to exhibit positive responses. The most common specific codes were the negative behavioral code *upset* and positive code *positive affect*.

Regression Analyses

How Confidence Varied by Participant Condition and Gender

We conducted linear regression models, analyzing how participants' language condition interacted with gender in predicting a child's

response to negative feedback. When looking at children's response types, we did not find a significant main effect of gender (X^2 (1) = 2.44712) or condition (X^2 (1) = 0.38311) on positive responses ($ps > 0.05$). We also did not find a significant effect of gender (X^2 (1) = 0.10664) or condition (X^2 (1) = 1.52852) on negative responses ($ps > 0.05$) .

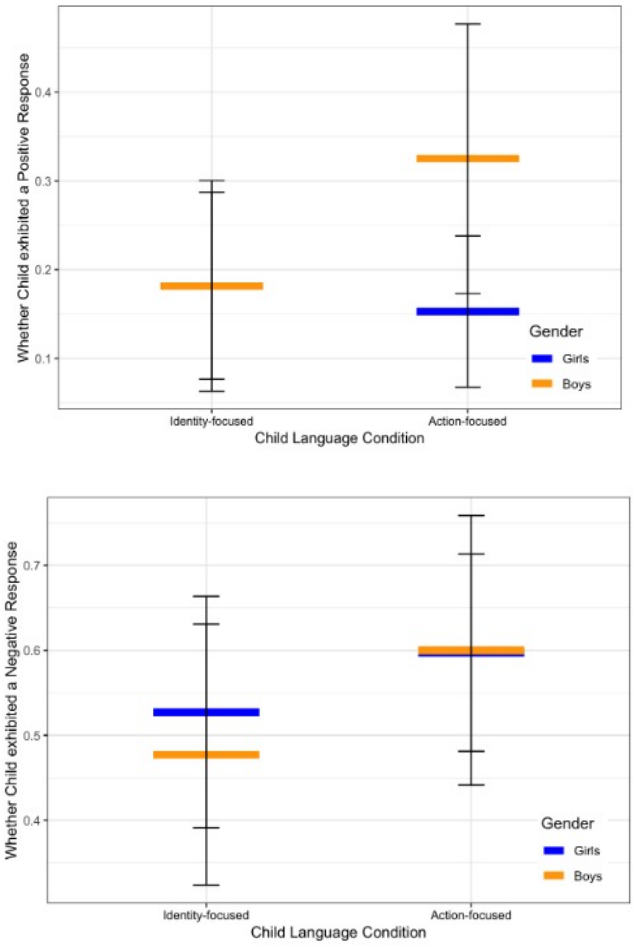

Figure 2. The likelihood of children exhibiting a positive (left) and negative (right) response by participant gender and assigned language condition.

The likelihood of participants exhibiting the negative verbal code *preoccupied with feedback* significantly varied by both gender (X^2 (1) = 6.5430) and condition (X^2 (1) = 6.4443) ($ps < 0.05$), however, there was no interaction between them. Girls were more likely than boys to exhibit this response, and those in the identity-focused condition were more likely than those in the action-focused condition. This was the only response language had a significant effect on.

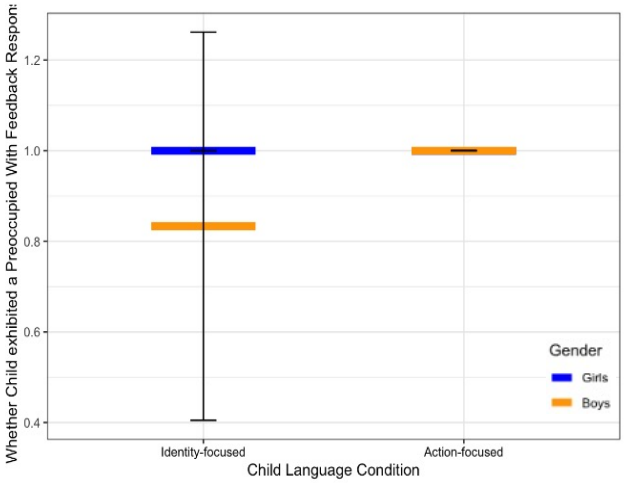

Figure 3. The likelihood of children exhibiting a *preoccupied with feedback* response by participant gender and assigned language condition.

How Confidence Varied by Participant Condition and Race

When looking at children's response types, we did not find a significant main effect of race (X^2 (1) = 0.0349) on positive responses or negative responses (X^2 (1) = 0.0345) ($ps > 0.05$).

How Participant Confidence, Condition, and Gender Shaped Persistence

Persistence for Session 1 by Confidence, Condition, and Gender. We also conducted negative binomial mixed-effects linear regression models looking at how participants' language condition interacted with gender and response type in predicting persistence. Childrens' persistence was not significantly predicted by their positive responses (X^2 (1) = 0.17029, $p > 0.05$), but was significantly predicted by their negative responses (X^2 (1) = 4.4274, $p < 0.05$). Overall, children who exhibited a negative result were less likely to persist, regardless of condition and gender (see Figure 4). This effect did not interact with gender and condition (X^2 (1) = 0.3898, $p > 0.05$).

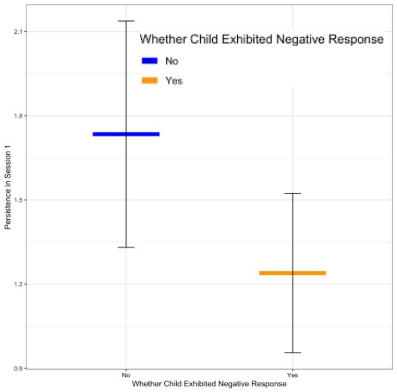

Figure 4. Children's persistence in session 1 by whether or not they exhibited a negative response.

When breaking down how gender shaped persistence in session one for girls, there was a significant interaction between negative responses and condition (X^2 (1) = 0.04082, $p < 0.05$). For boys, there did not appear to be any significant changes in persistence based on condition (X^2 (1) = 61.99298) or exhibition of a negative response (X^2 (1) = 1.99298) ($ps > 0.05$). There were no significant effects of positive or negative reactions on boys' persistence. Girls in the action-focused condition also did not show a significant difference in their persistence based on whether they exhibited a negative response (X^2 (1) = 0.021109, $p > 0.05$). However, in the identity-focused condition, girls who exhibited a negative response were less likely to persist than those who did not exhibit a negative reaction (X^2 (1) = 6.759, $p < 0.01$; see Figure 5).

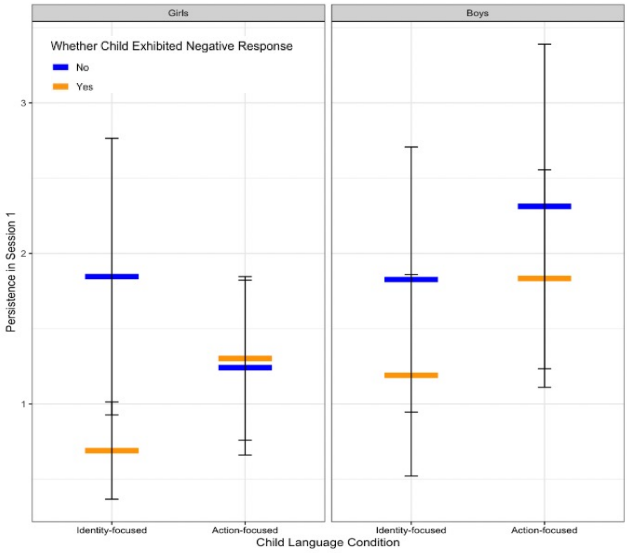

Figure 5. Children's persistence in session 1 by whether they exhibited a negative response, participant gender, and assigned language condition.

Average Persistence by Confidence, Condition, and Gender. We also looked at how condition, gender, and confidence shaped children's average persistence across all four sessions, despite only coding child confidence during the first session. However, we can look at these results to see how initial reaction to the setback in the first lesson affected persistence not just in the short term, but in the weeks following their first exposure to the setback. Similar to session one, participants who did not exhibit a negative reaction were significantly more likely to persist on average (X^2 (1) = 0.002379, $p < 0.01$; see Figure 6). The effects of negative responses on average persistence, however, did not interact with participant gender (X^2 (1) = 0.8261) or condition (X^2 (1) = 0.0526) ($ps > 0.05$).

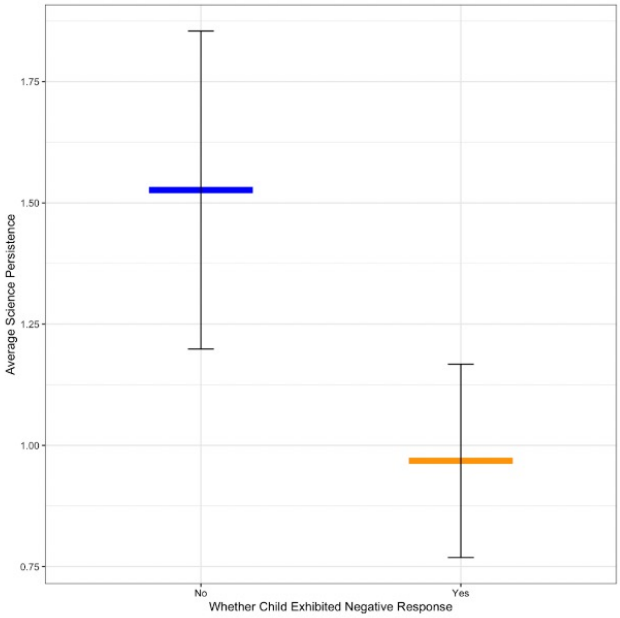

Figure 6. Children's average persistence for all four sessions by whether they exhibited a negative response.

We did not find any significant effects of positive responses on persistence, although there was a marginally significant interaction of condition, gender, and positive responses on persistence (X^2 (1) = 3.2894, $p > 0.05$; see Figure 7).

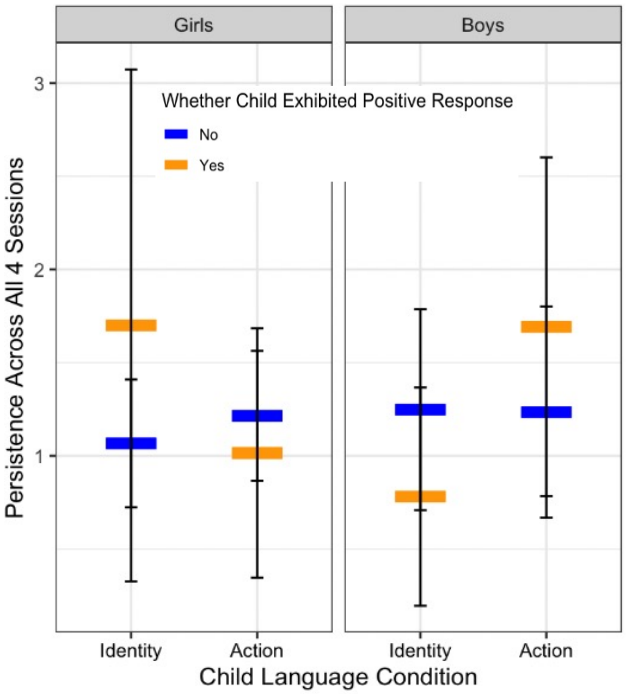

Figure 7. Children's average persistence for all four sessions by whether they exhibited a positive response, participant gender, and assigned language condition.

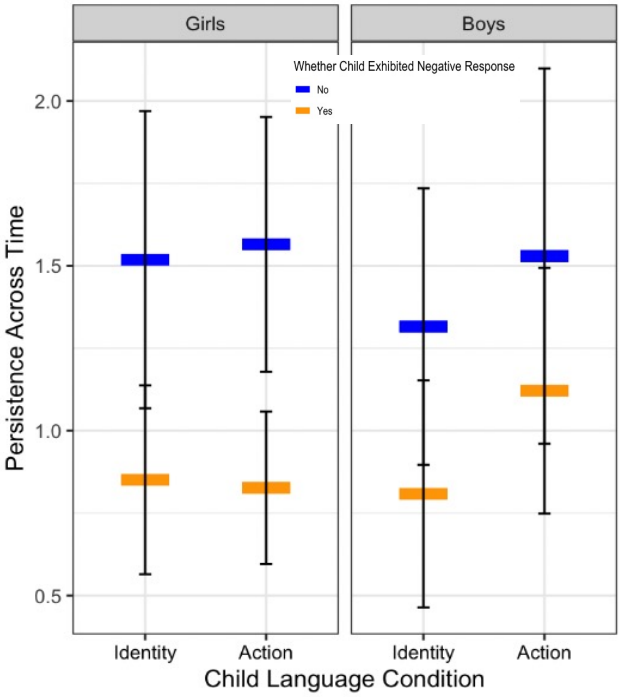

Figure 8. Childrens' persistence over time by whether or not they exhibited negative responses to the setback, participant gender, and assigned language condition.

Persistence Over Time by Confidence, Condition, and Gender. The data involving persistence in session 1 and the average persistence across the four sessions was analyzed in wide format, meaning that for each participant, there was a single data point for their persistence in session 1 and a single data point for their average persistence. The data looking at their persistence over time was in long format, meaning that for each participant, we had four data points, one for their persistence in each session. This was done in order to determine if childrens' persistence exhibited different trends over time. Overall, children persisted less in the later sessions (X^2 (1) = 9.9284, $p < 0.01$). There was a significant interaction effect between gender and session on persistence over time (X^2 (1) = 5.8095, $p < 0.05$). Consistent with the effects of responses on session 1 and average persistence, there was also a significant effect of negative responses on persistence over time (X^2 (1) = 9.3943, $p < 0.01$; see Figure 8).

Discussion

No main effect of language was found, meaning that children's emotions were not shaped by their assigned language condition after experiencing a setback, as was hypothesized. Language did, however, interact with childrens' negative responses and gender to predict persistence. Boys' persistence did not vary significantly, regardless of the language they were exposed to and their responses to the setback. This suggests that type of language has little effect on boys, possibly because they have less cause to doubt their "scientist" category membership. Girls in the action-focused condition exhibited stable persistence regardless of whether or not they exhibited negative responses, suggesting that while the setback may have caused them to experience momentarily lowered confidence, it did not affect their science engagement. Girls in the identity-focused condition persisted significantly less when they exhibited negative responses, suggesting they were unable to recover from the setback. A possible explanation for this is that girls in the identity-focused condition conceptualized

being a scientist as an innate trait rather than as a skill that someone could become better at, therefore internalizing the setback as diagnostic of their ability to be a scientist.

Main Effect of Language on Confidence Following the Setback

Contrary to our hypotheses, we found no significant evidence suggesting that the language manipulation (action vs. identity-focused language) created different confidence responses in children, including when gender and race were accounted for. Girls and boys were equally likely to produce negative or positive confidence responses, and the same goes for action and identity-focused language. It is possible that regardless of language, some children inevitably react poorly to setbacks, which is understandable, especially in this age range. The only specific child response type that language had a significant effect on was the verbal code, *preoccupied with feedback*.

Why was there no main effect of language?

In the identity-focused condition, boys and girls were equally likely to exhibit positive reactions. Boys and girls in this condition also exhibited negative reactions at a similar rate to each other, and overall exhibited more negative reactions than positive. Identity-focused language is thought to suggest that the "scientist" identity is a fixed part of a person (Rhodes, 2020). Although it is thought that this language is more harmful to those who are traditionally underrepresented and science and have more reason to doubt that they are scientists, the harmful effects do not only affect girls and racial minorities. It is possible that boys and girls who heard this language are similarly likely to exhibit immediate negative responses to the setback, despite seeing differences in persistence between them later in the study.

Overall, it appears that the language children heard did not significantly impact their reactions to the setback: action-focused language was not able to protect them from reacting negatively to the setback, nor did identity-focused language make them more likely to react negatively. The two language conditions did significantly impact how negative reactions predicted persistence following the setback, however.

Effect of Language and Gender on Verbal Cues

The only individual child response code type that produced significant results was the negative verbal code *preoccupied with feedback* (i.e., saying aloud: "I don't want to play anymore"; "I wanted to get that right"). In the entire sample, there was only one verbal response that wasn't *preoccupied with feedback*, with girls in the identity condition being significantly more likely to exhibit negative verbal codes. In the action-focused condition, boys and girls were equally likely to exhibit a *preoccupied with feedback* response. But in the identity-focused condition, girls were significantly more likely to produce this response. Girls in the identity-focused condition who exhibited negative responses were the only specific gender and condition interaction that resulted in significantly lower persistence. Girls in the identity-focused were more likely to exhibit this negative response, and those who exhibited a negative response were more likely not to persist, exemplifying the disparaging outcomes this language can have on girls' attitudes toward science. Setbacks are an inevitable part of science, meaning the ability to persist past them is vital to success and endurance in the field. Anything that hinders persistence, especially that of girls who are already underrepresented in STEM, should be avoided.

While we did think that there would be less variation between boys and girls in the action-focused condition, we hypothesized that boys would exhibit more negative responses in the identity-focused condition, not girls. Our reasoning was that boys in this condition would be surprised by the negative feedback, as they saw themselves as fitting the stereotypical scientist

mold, while girls would be less surprised. Therefore, the boys would show more of a negative reaction than the girls. While we found no significant results for any other codes, the opposite of what was hypothesized ended up being true for this verbal code.

A possible explanation for why girls were more likely to exhibit this verbal reaction than boys is that surprise was not the main factor in predicting their response. Rather, children in the identity condition conceptualized science as an identity one is or is not, and based on cultural stereotypes, believed boys are more likely to be scientists than girls. It's possible these results happened because boys are more confident in their science abilities and thus less likely to exhibit negative reactions, while girls are less confident and more likely to exhibit negative reactions.

A possible explanation for why girls in the identity condition were only more likely to exhibit verbal negative codes is that girls in the identity-focused condition who experienced negative feelings were more likely to exhibit them verbally, rather than behaviorally. A 2014 overview of how children express their emotions suggests that girls are biologically predisposed to have greater language skills than boys and this predisposition interacts with socialization to produce girls who are more likely to express their feelings verbally (Chaplin, 2014). This may explain why we only saw a significant effect of gender on reactions in the verbal category.

Effect of Language, Gender, and Negative Reactions on Persistence

Across all demographics and conditions, negative responses predicted lower persistence. This finding complements past findings that children are less likely to persist in tasks that they are less confident in their abilities to succeed at, especially those they perceive to be difficult. If receiving negative feedback makes children unsure of their ability to succeed at a task and view it as more difficult, it follows that they would be less likely to persist.

Why did exhibiting negative reactions predict lower persistence for girls in the identity-focused condition?

Girls in the identity-focused condition who exhibited negative reactions were significantly less likely to persist than those who did not. Identity-focused language is thought to be more harmful to groups who have reason to doubt their membership in the referenced group, aka scientists (Rhodes et al., 2020). This language suggests scientists are a special category of people, which in turn invites children to question whether they are a part of this group. Girls also endorse gender-STEM stereotypes by elementary school age (Masters, 2021). This means that when they question their science group membership, their assessment will be informed by these stereotypes (Masters, 2021).

For this particular study, it is possible that girls in the identity-focused condition conceptualized science as something only scientists did and believed that scientists were a specific category of people that did not include them. Therefore, those who exhibited lowered confidence following the setback were reinforced in the feeling they did not fit the scientist category. This may have made them less likely to believe they could successfully answer questions in the persistence task and more likely to choose not to persist (Rhodes et al., 2019). Essentially, it is possible these girls could not recover from feelings of decreased confidence following the setback.

Why was girls' persistence in the action-focused condition stable regardless of negative reactions?

For girls in the action-focused language condition, exhibiting negative confidence reactions did not predict lower persistence, unlike their counterparts in the identity-focused condition. Girls in the action-focused condition had most likely also been exposed to these same STEM stereotypes as those in the identity-focused condition, but the linguistic input they received instead suggested that one's ability to do science was unrelated to "fitting the scientist

category". Instead, they conceptualized science as an action anyone could partake in and improve at. This did not protect them from having their confidence affected by the setback (as shown by the non-significant main effect of language condition on negative responses). It does appear, however, that experiencing lowered confidence did not detriment their persistence the same way it did for girls in the identity-focused condition.

One possible explanation for the stable persistence of girls in the action-focused condition is that they were able to recover from the setback in a way girls in the identity-focused condition did not. Because they conceptualized science as an action or an activity one could become better at, when they experienced decreased confidence, they were more likely to believe this one wrong answer/setback was not diagnostic of their overall science ability. Since they viewed science as an action that was flexible and not fixed like an identity, they believed it was possible for them to succeed if they continued in the science game, and were more likely to persist. Action-focused language was not able to protect these girls from feelings of lowered confidence after the setback, and it is possible that that reaction is a natural response to getting something wrong that cannot be avoided. They were, however, more likely to recover from this setback and persist, because of how action-focused language led them to conceptualize science.

How did negative reactions affect boys' persistence?

Boys were not significantly less likely to persist if they exhibited negative reactions, despite this descriptively being the case in both conditions. Those in the action-focused condition were also more likely to persist than those in the identity-focused condition, although this was only a descriptive trend and not a significant effect. The lack of significant effects between the conditions suggests that language conditions simply have a less pronounced effect on boys. It is believed that identity-focused language is more harmful to those who have reason to doubt their group membership (Rhodes et al., 2020). Because boys are less likely than girls to feel this way, this may be why there were no significant differences based on condition in boys. The null effect found for boys is consistent with previous work done on the effect of identity versus action-focused language on children's science persistence (Rhodes et al., 2019).

Limitations and Future Directions

This study had several limitations. Only the first of the four persistence tasks was coded for children's reactions following the setback. This means we were unable to look at the effect language had on confidence over time, only at how *initial* reactions to the setback affected persistence over time. It is also possible that because children had only been exposed to the language during one lesson when we analyzed their reactions to the setback, the effect of the language conditions had not taken full effect, possibly explaining why there were null results for the main effect of language on children's responses. It is also possible that because of our young age group, this was the first time children had experienced a setback in science and were surprised. This surprise could possibly explain why girls in both conditions were equally likely to show negative responses to the setback.

There was also no baseline established for each child's relationship with doing science prior to the study. It is possible that the children's preconceived notions were the result of societal stereotypes, or how they saw science being modeled in the home. If a child grows up in a home where their female caregiver does science for their career, it could diminish the effect of science stereotypes on that child's science efficacy. Including information about how the child's understanding and relationship with science prior to hearing action or identity-focused language could be informative.

Additionally, we had planned to account for race and ethnicity in our analyses, but our final sample following exclusions was not diverse

enough for these analyses to be properly conducted. Instead, we only analyzed them as White and non-White groups. We also did not have an even number of participants in each language condition, with more participants in the action-focused condition, as well as more girls than boys in the final sample.

Further studies could include a more racially diverse sample in order to conduct more in-depth analyses on how linguistic input and race interact to predict science confidence and persistence. This study also looked at whether certain indicators of decreased confidence were present but did not include the number of each indicator present in analyses. For example, if a child exhibited three negative verbal behaviors, and then one positive behavior, then that child was coded as exhibiting negative verbal behavior and positive behavior, but the number of times each type of behavior occurred was not included. This was done for our logistical purposes but further studies could also look at not only whether children had their confidence hurt by the setback, but the extent to which this occurred and whether this differs by language condition, gender, and race.

Conclusions

Unfortunately, setbacks like the ones faced by the participants are unavoidable in the STEM field, and language that makes girls more susceptible to setbacks potentially furthers the gender gap in STEM. Action-focused language did not prevent girls from exhibiting lowered confidence following the setback but it did not hurt their overall persistence, possibly because it enabled them to recover, which is key to succeeding in difficult fields like science.

References

Bian, L., Leslie, S.-J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, *355*(6323),389–391. https://doi.org/10.1126/science.aah6524

Cech, E., Rubineau, B., Silbey, S., & Seron, C. (2011). Professional role confidence and gendered persistence in engineering. *American Sociological Review*,*76*(5),641–666. https://doi.org/10.1177/0003122411420815

Chambers, D. W. (1983). Stereotypic images of the scientist: The draw-a-scientist test. *Science Education*, *67*(2),255–265. https://doi.org/10.1002/sce.3730670213

Chaplin, T. M. (2014). Gender and emotion expression: A developmental contextual perspective. *Emotion Review*,*7*(1),14–21. https://doi.org/10.1177/1754073914544408

Charlesworth, T. E., Yang, V., Mann, T. C., Kurdi, B., & Banaji, M. R. (2021). Gender stereotypes in natural language: Word embeddings show robust consistency across child and adult language corpora of more than 65 million words. *Psychological Science*, *32*(2), 218-240.

Eaton, A. A., Saunders, J. F., Jacobson, R. K., & West, K. (2019, June 3). *How gender and race stereotypes impact the advancement of scholars in STEM: Professors' biased evaluations of physics and biology post-doctoral candidates - sex roles*. SpringerLink. Retrieved March 28, 2022, from https://link.springer.com/article/10.1007/s11199-019-01052-w

Funk, C., & Parker, K. (2020, August 21). *Women and men in STEM often at odds over workplace equity*. Pew Research Center's Social & Demographic Trends Project. Retrieved October 21, 2021, from https://www.pewresearch.org/social-trends/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/.

Kiefer, A. K., & Sekaquaptewa, D. (2007). Implicit stereotypes and women's math performance: How implicit gender-math stereotypes influence women's susceptibility to stereotype threat. *Journal of Experimental Social Psychology*, *43*(5), 825–832. https://doi.org/10.1016/j.jesp.2006.08.004

Lei, R. F., Green, E. R., Leslie, S. J., & Rhodes, M. (2019). Children lose confidence in their potential to "be scientists," but not in their capacity to "do science." *DevelopmentalScience*,*22*(6). https://doi.org/10.1111/desc.12837

Martin, C. L., & Ruble, D. (2004). Children's Search for Gender Cues: Cognitive Perspectives on Gender Development. *Current Directions in Psychological Science*, *13*(2), 67–70. http://www.jstor.org/stable/20182912

Master, A. (2021). Gender stereotypes influence children's stem motivation. *Child Development Perspectives*, *15*(3), 203–210. https://doi.org/10.1111/cdep.12424

McGuire, L., Mulvey, K. L., Goff, E., Irvin, M. J., Winterbottom, M., Fields, G. E., Hartstone-Rose,

A., & Rutland, A. (2020). Stem gender stereotypes from early childhood through adolescence at Informal Science Centers. *Journal of Applied DevelopmentalPsychology*,*67*,101109. https://doi.org/10.1016/j.appdev.2020.101109

Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The development of children's gender-science stereotypes: A meta-analysis of 5 decades of U.S. draw-a-scientist studies. *Child Development*, *89*(6), 1943–1955. https://doi.org/10.1111/cdev.13039

Miller, D. I., Linn, M. C., & Eagly, A. H. (2014). Supplemental material for women's representation in science predicts national gender-science stereotypes: Evidence from 66 nations. *Journal of EducationalPsychology*,*107*(3). https://doi.org/10.1037/edu0000005.supp

Rhodes, M., Cardarelli, A., & Leslie, S.-J. (2020). Asking young children to "do science" instead of "be scientists" increases science engagement in a randomized field experiment. *Proceedings of the National Academy of Sciences*, *117*(18), 9808–9814. https://doi.org/10.1073/pnas.1919646117

Rhodes, M., Leslie, S.-J., & Tworek, C. M. (2012). Cultural Transmission of Social Essentialism. *Proceedings of the National Academy of Sciences*, *109*(34), 13526–13531. https://doi.org/10.1073/pnas.1208951109

Rhodes, M., Leslie, S.-J., Yee, K. M., & Saunders, K. (2019). Subtle linguistic cues increase girls' engagement in science. *Psychological Science*, *30*(3), 455–466. https://doi.org/10.1177/0956797618823670

Wang, M. M., Cardarelli, A., Leslie, S.-J., & Rhodes, M. (2022). How children's media and teachers communicate exclusive and essentialist views of science and scientists. *Developmental Psychology*. Advanceonlinepublication. https://doi.org/10.1037/dev0001364

Zimmerman, B. J., & Ringle, J. (1981). Effects of model persistence and statements of confidence on children's self-efficacy and problem solving. *Journal of Educational Psychology*, *73*(4), 485–493. https://doi.org/10.1037/0022-0663.73.4.485