Zero-Sum Mindset & Its Discontents

Patricia Andrews Fearon

Selwyn College

UNIVERSITY OF CAMBRIDGE

July 2022

This dissertation is submitted for the degree of Doctor of Philosophy.
Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the preface and specified in the text. It is not substantially the same as any work that has already been submitted before for any degree or other qualification except as declared in the preface and specified in the text. It does not exceed the prescribed word limit for the Faculty of Biology Degree Committee.
Acknowledgments

I would first like to thank my supervisor, David Good for his commitment to asking “good questions”—no matter the scope of their ambition—and for putting his faith in my ability to pursue them. I would also like to thank my graduate advisor, Eolene Boyd-MacMillan for the countless ways she has supported me both personally and professionally. Far exceeding what anyone could reasonably expect from a mentor, collaborator, and friend. It has been an unspeakable privilege to have Eolene in my corner.

I am indebted to Gates Cambridge Trust for this rare opportunity to pour my time and energy into research that I hope will be worthwhile. It was a tremendous honor to be a Gates Scholar at Cambridge and an even greater gift to be a member of such an inspiring community.

I would also like to thank Paul Collier and Dennis Snower, as well as the Social Cooperation Research Hub and broader Rebuilding Macroeconomics project supported by the ESRC—for their invaluable intellectual and financial support of this research.

I owe a debt of gratitude to so many…

To my many brilliant collaborators and who helped me bring this investigation to new cultural contexts: To Eolene Boyd-MacMillan, Verena Knerich, Valerie DeMarinis, and Maria Nordendahl, and to partners at the European Forum for Urban Security, who supported the BRIDGE project in Italy and Belgium. To Andleeb Zahra, Sara Savage, Feriha Peracha, Raafia Raees, and the US Institute of Peace in Pakistan.

To Shai Davidai, whose collaboration and mentorship has been a fount of motivation and joy.

To Iris Mauss and Oliver John and the rest of the EER Lab at UC Berkeley who have always provided such a generous intellectual community.

To my brilliant colleagues and collaborators at Cambridge: Friedrich Götz for his invaluable inputs and positive energy. To Greg Serapio-Garcia for his support in longitudinal growth curve modeling.

To my beloved community in Cambridge: Lily Bentley, Nick Connor, Parker Lawson, and Anna Malaika NtiAsare-Tubbs, and to Karly Drabot, Akhila Denduluri, Cansu Karabiyik, Hiba Salem, Alex Spencer and Linsday Branham. You all are my haven and inspiration.

To my beloved community in San Francisco: Nicole Kravec, Pedro Paredes, Filip Ilievsky, Adriana Tajonar, Jessica Henry, Ryan Devens, Jon Schoonhoven, and Hannah Russell-Goodson, whose friendship and thoughtful conversation is a constant source of sanity and delight.

To my beloved family, my siblings, Elizabeth Lineberry, Chase Andrews, to JD Smith, and of course chiefly, to my mom, Elizabeth Barnes Andrews Smith, who has modeled and supported a lifelong love of curiosity. To my own little one, Quinn, who came into being alongside this dissertation.

And most importantly, to Frank, my partner in the adventures, the mischief and in the mundane. There is no part of my life you have not enhanced with your love, brilliance, and tireless support.
Summary

Across a wide range of pressing global challenges from democratic erosion, pandemics, climate change and economic development, there is an underlying psychological feature that presents a barrier to progress: zero-sum thinking.

Zero-sum thinking is a tendency to perceive a situation as a zero-sum game, where for one player to win, another must lose. In a zero-sum game, winnings exist in a fixed amount. Therefore, any gain for one party must come at the expense of others, rendering mutual gain, or mutual loss, impossible. Though purely zero-sum situations are extremely rare in lived reality, zero-sum beliefs are not. That is, people often perceive relationships to be zero-sum even when they are explicitly not so. Such zero-sum beliefs undermine potential cooperation towards achieving shared goals and overcoming shared challenges.

While a small, but growing, literature examines the causes and effects of zero-sum beliefs within particular situations and domains, this research investigates whether people might hold an implicit belief that relationships in general are like a zero-sum game. I propose that such a belief, which I call zero-sum mindset, predisposes one towards zero-sum thinking and its consequences across a wide variety of situations and domains.

At the crossroads of social psychology, which emphasizes the “power of the situation,” and personality psychology, which emphasizes the importance of “individual differences,” this research examines individual differences in perceptions of one’s general situation. My research demonstrates that when one holds a generalized construal of social interactions as a zero-sum game, the power of the perceived zero-sum situation forms a stable pattern of perceptual tendencies, motivations, and strategies.

Using a multi-method approach (including experiments, economic games, panel data, and large-scale multi-national surveys), I have examined the effects of zero-sum mindset in more than 10,000 unique participants across six countries and three continents. In the research presented here, I refine the concept and measurement of a zero-sum mindset. I also examine its breadth and stability, presenting evidence that a zero-sum mindset predicts zero-sum thinking and its cognitive and strategic corollaries across time and a variety of domains and situations. Finally, after demonstrating the consequences of the broader mindset, this research also examines the downstream effects of a zero-sum mindset on specific zero-sum beliefs that impact intragroup and intergroup relationships. Altogether, I find that zero-sum beliefs impair trust and cooperation, and motivate dominance and aggression strategies across a wide variety of situations and domains.
# TABLE OF CONTENTS

**Introduction**  
8

**Chapter 1 -**  
**Measuring Zero-Sum Mindset**  
21

**Chapter 2 -**  
**Conceptualizing Zero-Sum Mindset**  
34

**Chapter 3 -**  
**Predicting Specific Zero-Sum Beliefs Across Unrelated Domains**  
42

**Chapter 4 -**  
**Zero-Sum Mindset & Cognitive Style**  
54

**Chapter 5 -**  
**Zero-Sum Mindset & Social Cognition**  
63

**Chapter 6 -**  
**Zero-Sum Mindset & Trust**  
75

**Chapter 7 -**  
**Zero-Sum Mindset & Cooperation**  
106

**Chapter 8 -**  
**Zero-Sum Mindset & Individual Success**  
121

**Chapter 9 -**  
**Zero-Sum Mindset & Collective Success: Democratic Erosion**  
128

**Chapter 10 -**  
**General Discussion**  
166
Introduction
Introduction

Why do people often resist cooperation even when it is in their best interest? In the final analysis, failure to cooperate to solve climate change, protect our democracies, battle pandemics, and end bloody conflicts, will only be to our collective detriment. Yet, many still eschew the cooperative strategies needed for solving these pressing problems. Why? One reason may be that we are “playing different games.” More specifically, some may see their interests through the lens of a zero-sum game where in order for one person to win, someone else must lose.

To be successful in any given interaction, you have to know what kind of game you are playing. That is, you have to understand how your success relates to the success of other players in the game in order to interpret the meaning of their actions and to determine your next best move. Precise analysis of the effects of such incentive structures on strategic behavior became possible with von Neuman’s seminal paper, “On the Theory of Games of Strategy” (1928). Since then, game theory has made invaluable contributions to our understanding of choices and their consequences in dynamic interactions across fields as diverse as economics, computer science, biology, political science, and philosophy (Axelrod & Dion, 1988; Maynard Smith, 1974; J. F. Nash, 1950). These models of incentive structures and their “solutions,” or equilibriums, have enabled game theorists to provide powerful advice to decision makers seeking to choose the best possible strategies.

Traditional game theory is predicated upon the basic assumptions of rational choice theories. Rational choice theories take as a starting point an assumption that individual decision-makers conduct a reasoned cost-benefit analysis and make their choices based on a rational maximization of their own individual benefit (Smith, 1776). Despite the many achievements of these theories, the inadequacy of the individual “utility maximizing” model for explaining actual human behavior has given rise to new subfields such as behavioral economics and behavioral game theory (Allais, 1979; Boudon, 2003; Kahneman & Tversky, 1979). Critiques of rational choice theories include the unrealistic assumptions of the cognitive capabilities of decision-makers (Simon, 1990), neglect of the social context in which decision-makers operate, and what is more, the socially constructed nature of both one’s motives and one’s environment (Bourdieu, 2005).

Implicit Game Theory

So, while game theory can model the ideal strategies of many different kinds of games, it provides little insight into the social and psychological architecture underpinning an individual’s or group’s interpretation of what kind of game they believe they are playing. In other words, in each
situation people must make *implicit* judgments about the nature of the relationship between themselves, others and the incentives in the situation. Since different games require different strategies to be successful, the ability to form implicit mental models of the “games” we think we are playing can help direct what we think, feel, and do to be successful in that situation.

Although game theory utilizes dozens of game structures that attempt to replicate the infinite variety of possible incentive structures, previous research has found that a small number of archetypal games can capture the ways most people think about the strategic structure of their interactions (Halevy et al., 2006, 2012; Halevy & Phillips, 2015). Halevy and colleagues identify four “conflict templates” or mental representations of the game theoretical structure of social interactions, and find that both situational influences (e.g., a negotiation situation vs. a joint decision-making situation) and individual differences (i.e., an individual tendency to endorse certain conflict templates across situations) explained variations in endorsements of different conflict templates. This approach used a variety of discrete game models to capture a small continuum of outcome interdependencies, but the authors suggest that future work may wish to investigate mental representations of games based on one particularly important underlying dimension. Specifically, they note that the high correlations between competitive and cooperative games “raise the possibility that lay thinking about social interactions is shaped primarily by perceptions of conflict of interest (i.e., goal incompatibility)” (Halevy & Phillips, 2015, p. 20).

On this point, psychologists and behavioral economists agree. Recent attempts to identify the properties of game models in terms of their ability to predict actual behavior (not just the behavior a mathematical solution would prescribe) suggest that it can be reduced to “game harmony” (Zizzo & Tan, 2007, 2011). Game harmony describes the degree of conflict or harmony of the interests of players in a game as manifested in the game’s raw payoffs. On this spectrum, the strongest form of goal incompatibility is the zero-sum game.

**The Zero-Sum Game**

The architect of game theory, John von Neumann, first set out to solve the zero-sum game precisely because of its simple structure. He believed that developing a theory of games and rational strategy could not be possible if he could not first solve its simplest game (von Neuman & Morgenstern, 1944). The essential feature of a game in game theory is its “payoff matrix” – that is, the description of possible outcomes for the players in the game. So, if in a two-player game, Player 1’s total payoff (the rewards, winnings, or earnings that define success in a game) is represented by A, and Player 2’s payoffs are represented by B, then a game is considered zero-sum when A + B = 0; that
is, when all gains and losses sum to zero. This means that whatever is gained by one player must be lost in equal measure by the other. This definition entails the following assumptions about the nature of success in a zero-sum game:

1. **Fixed Rewards** - The number of rewards that define success exist in a finite, limited amount. Rewards or value in a zero-sum game cannot be created or destroyed, only exchanged.

2. **Antagonistic Interests** – Because of the fixed sum, the gains and losses of one player directly impact other players. So, not only can success not be shared in a zero-sum game, one person’s success is diametrically opposed to the success of another in a relationship of antagonistic interdependence.

Since the development of “zero-sum” and “non-zero-sum” game concepts in game theory, these models have been leveraged to articulate the nature of resources and incentives across a wide variety of domains that are animated by dynamic interactions.

Importantly, these concepts have often helped clarify mistaken assumptions about the outcomes that are possible in a given situation so that better choices may follow. For this reason, cognitive scientist and linguist Steven Pinker describes the concept of the zero-sum game as one of the most important scientific concepts one could add to their cognitive toolkit:

When people become consciously aware of the game-theoretic structure of their interaction (that is, whether it is positive-, negative-, or zero-sum), they can make choices that bring them valuable outcomes — like safety, harmony, and prosperity — without their having to become more virtuous, noble, or pure. (Pinker, 2011, para. 4)

Pinker even suggests that the innovation of these concepts and our increasing awareness of them may have contributed meaningfully to increasing peace and prosperity over the last half century (Pinker, 2011). Going further, author Robert Wright argues that increasing awareness of our non-zero-sum relationships not only accounts for recent human progress, but also encapsulates the entire arc of biological and social evolution (Wright, 2000).

More recently, the zero-sum and non-zero-sum concepts have been leveraged to illustrate the damage that follows our failure to recognize the non-zero-sum nature of our relationships to one another. In her book, The Sum of Us, Heather McGhee gives an account of the myriad ways in which racism hurts everyone, white people included (McGhee, 2021).
These ideas illustrate the profound power of the zero-sum and non-zero-sum concepts. To understand why these different conceptual models bear such hopeful and devastating consequences requires understanding the strategic implications of a zero-sum structure of success.

Success in a zero-sum game requires different strategies than success in a non-zero-sum game. Where non-zero-games may require different, even opposing, parties to cooperate with each other in order to maximize their joint gains (or minimize joint losses), zero-sum games offer no such inducements for cooperation (Nash, 1951). Quite the contrary, in a zero-sum game, one’s success is earned in equal measure to the loss inflicted upon other players. In other words, it is not merely that cooperation is fruitless in a zero-sum game, but also that success requires a strategy of dominance.

The term “zero-sum thinking” or “zero-sum belief” describes an appraisal of a situation or domain as zero-sum without regard to whether this is objectively the case. If picking the best strategy depends on an accurate appraisal of the game at hand, then zero-sum thinking should lead to the best strategies when faced with a real zero-sum situation.

However, purely zero-sum situations are rare in the real world, and tend to exist only when narrowly conceived. For example, even a tennis match, a prototypical zero-sum game, when considered in its real-world context may be connected to non-zero-sum outcomes for the all the players: perhaps the benefits of exercise, the development of skills practiced, or even the simple the pleasures of play and competition that can be enjoyed by both players—win or lose.

Of course, to say that most situations in the real world are not truly zero-sum in nature is not to deny the proliferation of situations in which one person or group benefits at the expense of another—mirroring the payoff structure of a zero-sum game. Yet, whether or not a situation is truly zero-sum is not defined by specific outcomes (or in more human terms, the historic facts of brutal exploitation). Rather, it is determined by what kinds of outcomes are possible in any given situation. McGhee summarizes this distinction with painful clarity:

It’s hard for me to stand here as a descendant of enslaved people and say that the zero sum wasn’t true, that the immiseration of people of color did not benefit white people. But I have to remind myself that it was true only in the sense that it is what happened—it didn’t have to happen that way. It would have been better for the sum of us if we’d had a different model. (McGhee, 2021, p. 13, emphasis added)

Despite this, misappraisals of a situation or domain as zero-sum are far from rare (Meegan, 2010). Indeed, the basic misappraisal of economics as a zero-sum game has been described as the default
assumption underlying all of “folk economics” (Boyer & Petersen, 2017; Johnson, 2018; Rubin, 2003). Furthermore, because the best strategies in a real zero-sum situation can be detrimental in a non-zero-sum situation, these misappraisals can bear devastating consequences for individual and collective success.

**Construal Levels of Zero-Sum Beliefs**

Zero-sum beliefs exist on a continuum from the specific to the general. On the specific end of the spectrum, one might hold a zero-sum belief that extends only as far as an immediate situation. For example, one might see a race for the last remaining seat in a cafe as a zero-sum competition, but this zero-sum belief is unlikely to pertain to other cafes or even the same cafe after some time has passed.

More broadly, one might hold a zero-sum belief about a category of situations or resources, such as a zero-sum belief about the nature of negotiations (Bazerman, 1983; De Dreu et al., 2000), or the job market in general (also known as the “lump of labor fallacy” (Walker, 2007)), which may activate a zero-sum construal of success any time one enters a negotiation or job-seeking context.

One particularly important category of zero-sum beliefs are the beliefs about the relationships between specific groups. For example, when white people in the United States interpret a decrease in prejudice against black people as an increase in prejudice against white people (Brown & Jacoby-Senghor, 2021; Norton & Sommers, 2011; Wilkins et al., 2022), when men view the rising status of women as a threat to their own status (Kuchynka et al., 2018; Ruthig et al., 2017; Stefaniak et al., 2020; Wilkins et al., 2015), when Christians view gains in LGBTQ rights as an infringement upon their own rights (Wilkins et al., 2022), when native-born citizens view support for recent immigrants as a threat to their job prospects (Esses et al., 1998, 2001), when nations engaged in prolonged conflict perceive compromise to be impossible or dangerous (Hameiri et al., 2014; McCauley, 2005) or when a nation considers the economic prosperity of another as an affront to its own prosperity (Roberts & Davidai, 2021)—the prevalence of zero-sum thinking in intergroup relations is particularly pervasive and pernicious. In these intergroup contexts, zero-sum beliefs about group relationships often interact with zero-sum beliefs about resources that are both material, such as jobs or wealth, or symbolic, such as identity or status (Andrews Fearon, 2022; Esses et al., 1998; Smithson et al., 2015).

Zooming out still further, zero-sum beliefs can be applied to entire domains such as politics or economics where one might view an entire system of relationships and resources within the domain as being characterized by zero-sum competition (Johnson, 2018; Różycka-Tran et al., 2015; Sirola & Pitesa, 2017). At this level of analysis, the domain-specific zero-sum belief can apply across situations
and resources, but still only to those situations where the relevant domain is activated. For example, a person may hold a zero-sum belief about economic success in general, that inclines her to perceive a wide variety of economic exchanges, micro or macro, as benefitting one person at the expense of another. However, even this broad belief would not necessarily bear any implications for one’s success outside the economic domain, where one may see other kinds of exchanges as mutually beneficial.

Finally, at the broadest level of zero-sum construal, one might hold the belief that the game of life or success in general is zero-sum. At this level, zero-sum thinking may pertain to all relationships across a wide variety of unrelated domains and situations, bearing the consequences of zero-sum thinking in each domain. This global level of zero-sum thinking, I call zero-sum mindset.

**Zero-Sum Mindset**

I define zero-sum mindset as a generalized, cross-situational, cross-domain tendency to construe relationships, resources, and success in general, as zero-sum. The overarching hypothesis of this research is that this tendency to see life through the lens of a zero-sum game will be attended by the same cognitive, motivational, and strategic implications of being in a real zero-sum situation, even when the situation is objectively not zero-sum. Therefore, to the extent that success in a non-zero-sum situation depends upon recognizing it as such, a zero-sum mindset will undermine this success.

To effectively navigate interpersonal and group relations, people need to hold accurate mental models of the situations within which they find themselves. Therefore, we expect the most adaptive strategic responses to emerge from the most accurate appraisals of the situation. Of course, some situations really are zero-sum in nature, and to recognize and respond to them as such would not require a zero-sum mindset. Therefore, when zero-sum mindset is low, we would expect the objective situation itself and other, more proximal, factors to determine the construal of the situation. This would include responding to a truly zero-sum situation as such. However, when there is a generalized inclination to see a situation as zero-sum, that is, when zero-sum mindset is high, we would expect to find a tendency towards zero-sum thinking even when the situation is objectively not zero-sum.

Moreover, even the truly zero-sum elements of social life are usually embedded in a more complex non-zero-sum system of relationships. For example, someone engaged in a truly zero-sum negotiation might stand to gain by using force or intimidation. Yet, such behavior may have consequences beyond that particular interaction, as when people develop reputations that lead others to avoid working with them. Therefore, mental models and strategies that fail to account for superordinate integrations of one’s interests with others’ interests, may ultimately undermine their
own success. So, while those who hold a zero-sum mindset may demonstrate patterns of thinking and behaving that would serve them well in a world of zero-sum competitions, the systematic neglect of opportunities to benefit from cooperation may ultimately prove to be costly.

At the Crossroads of the Person-Situation Interaction

To explain stable patterns in the way people think, feel and behave across situations, most theories of individual differences focus on differences in *internal attributes*, primarily conceived as personality traits or cognitive abilities (John et al., 2008; McCrae & Costa, 1997; Tyler, 1947). For example, well-established measures of personality such as the Big Five begin with prompts such as “I am someone who….” followed by descriptions of one’s personal characteristics (Soto & John, 2017). In contrast, a zero-sum mindset represents an individual difference in one’s general belief about the nature of their *external situation*, regardless of the person’s specific characteristics or goals. To see life as a zero-sum game is to hold a stable belief about the social environment in which one operates.

While the person-situation debate in psychology has long argued about whether behavioral causality should be understood as originating from the characteristics of the person or from the characteristics of the situation (Fleson, 2004; Furr & Funder, 2019; Mischel & Shoda, 1998), theories such as zero-sum mindset require both. That is, to understand the psychological mechanisms that lead from a zero-sum mindset to behavior follows the logic of a strategic response to a situation, in this case, a zero-sum situation. In other words, the power of a zero-sum mindset is fundamentally “the power of the situation.” And yet, as the evidence presented here suggests, there appear to be stable individual differences in people’s propensity to activate a perception of a situation as zero-sum.

Generalized “Situational” Beliefs

However, this work is not the first to recognize the power of our beliefs about our *generalized situation* that we call “life” or “the world.” A broad range of research has examined various generalized beliefs such as “Belief in a Just World” (Hamilton & Lerner, 1982), or “Dangerous vs. Competitive Worldviews” (Duckitt & Sibley, 2007; Perry et al., 2013; Sibley & Duckitt, 2013). Though such research has been largely fragmented and siloed within certain areas of research. More recent research has undertaken a comprehensive and systematic endeavor to identify the primary dimensions of people’s implicit, general beliefs about what the world is like (Clifton et al., 2019). This research identified 26 such beliefs, resulting in a 99-item inventory of “Primal World Beliefs.” These primal world beliefs were found to be highly stable over time and to account for variance in wellbeing over and above measures of the Big Five personality traits. It is even suggested that such stable beliefs may play a critical role in the formation of personality itself (Clifton et al., 2019). At present, primal
world beliefs have largely been leveraged to understand differences between individuals, while a similarly broad category of implicit beliefs, known as “social axioms,” has largely been leveraged to understand differences between cultures.

Social axioms are defined as “generalized beliefs about oneself, the social and physical environment, or the spiritual world, and are in the form of an assertion about the relationship between two entities or concepts” (Leung et al., 2002, p. 289). Where primal world beliefs are *adjectival*, describing what the world is *like* (e.g., The world is *beautiful* or *safe*), social axioms are *structural*, describing the relationship *between* things in a way that implies causality (e.g., Effort leads to success or religion makes people good). Leung et al. propose five social axioms which predict country-level outcomes such as suicide rates and the status of women (Leung et al., 2002). Following on this, Różycka-Tran, Boski, & Wojciszke proposed that a general belief in a zero-sum structure of economic success should be considered a sixth social axiom (Różycka-Tran et al., 2015).

Różycka-Tran, Boski, & Wojciszke developed the “Belief in Life as a Zero-Sum Game” (BZSG) scale to measure the conviction that, as the authors describe it, “success, especially economic success, is possible only at the expense of other people’s failures” (2015, p. 528). Testing the scale in 37 nations, the authors found evidence for the measure’s invariance as well as isomorphism at the individual and country-level (Różycka-Tran et al., 2017). In this cross-cultural research, higher country-level BZSG scores have been associated with higher military spending and lower civil liberties (Różycka-Tran et al., 2019), lower satisfaction with life (Różycka-Tran et al., 2019), and lower GDP among other socioeconomic variables. In distinguishing BZSG from other social axioms, the authors clearly state that “BZSG describes the economic domain” (2015, p. 541). Given the demonstrated cross-cultural relevance of this scale, I set out to build upon this work rather than recreate it. To do this, I adapted and re-validated the scale to measure a *fully generalized* view of relations as zero-sum rather than *economically oriented* zero-sum beliefs (Chapter 1). The resulting scale and general construct I refer to as a “zero-sum mindset.” However, the BZSG and zero-sum mindset differ not only in the degree to which the concept is fully generalized, or in the modifications of the language applied to the final scale, they also differ in their modality and the phenomena they seek to describe, and in their relationships with other social and psychological variables.

While the concepts of “social axiom” and “mindset” both refer to generalized and often implicit beliefs, social axioms describe the fundamental beliefs that shape differences across cultures, while mindsets describe the way a generalized belief can orient individual psychological processes towards certain perceptions and behaviors. Following in the tradition of “mindset research,” I adopt the term mindset in a similar way that it is used to describe lay theories of intelligence (i.e., growth
mindset) or stress (Crum et al., 2013; Dweck, 2012; Walton & Wilson, 2017). In this literature, a mindset is defined as a “mental frame or lens that selectively organizes and encodes information, thereby orienting an individual toward a unique way of understanding an experience and guiding one toward corresponding actions and responses” (Crum et al., 2013). In the same way, I propose that a zero-sum mindset is a mental model of success in dynamic interactions that might shape perception and behavior in important ways. More specifically, I propose that the mental lens of a zero-sum game—in which others’ success is encoded as your failure and your failure as others’ success—promotes interpretations of threat and hostility from others, thereby eroding the trust and cooperation that is essential for individual and collective success.¹

Overview of the Investigation

This research examines the hypothesis that the psychological phenomenon of zero-sum thinking, that is, a belief that a resource, relationship, or success in any given situation is like a zero-sum game, can also be understood as a generalized belief about how the world works. More importantly, I propose that this mindset predicts zero-sum thinking, its cognitive and behavioral corollaries, and its consequences across domains and situations.

This work is the result of a broad investigation into the phenomenon of zero-sum mindset spanning four years and seven countries and more than two dozen samples comprising more than 15,000 unique participants.² For the sake of clarity, studies are organized by hypothesis rather than by participant sample, so that all evidence bearing upon a particular hypothesis can be evaluated together alongside various replications in different samples and cultural contexts. An overview of all data collections, pre-registrations, recruitment methods and sample demographic characteristics can be found in the Appendix in Table A1.

To investigate this broader hypothesis, I examine the following predictions:

Chapter I. Zero-sum mindset, the general belief that success is zero-sum can be meaningfully distinguished from the domain-specific belief that economic success is zero-sum.

Chapter II. To hold a zero-sum mindset is to hold general beliefs about the world that are consistent with being a zero-sum situation.

¹ While describing the theoretical model linking zero-sum mindset to behavior in terms of a linear process, please note that observational (non-experimental) studies cannot be used to determine causality. Where possible, experimental and longitudinal designs are used to help evaluate the direction of influence in the relationship between variables.

² This total includes additional ongoing research not presented in this dissertation.
In Chapter 1, I examine the hypothesis that a general belief that success is zero-sum, which to this point has been conflated with the belief that economic success is zero-sum, can be understood as a distinct construct. To do this I conduct a multi-level confirmatory factor analysis (CFA) using the 42-nation BZSG dataset. I also conduct a pre-registered CFA with a new sample of participants in the US, and again in Italy. I also review additional scale development and validation of additional reverse-key items to help balance the scale for acquiescence, as well as the revised scale’s retest reliability across several days, weeks and months.

In Chapter 2, I continue to develop the nomological net of a zero-sum mindset by investigating whether a zero-sum mindset will be related to primal world beliefs in a way that is consistent with a generalized view of life as a zero-sum game. Furthermore, I use a lasso regularized regression to examine which primal world beliefs are most essential to a zero-sum mindset, and to test whether variance in zero-sum mindset might be best explained by any single primal world belief such as a general belief in scarcity or competitiveness. Given the central role of scarcity in a zero-sum game and the two distinct, but related, ways that people often define scarcity, I also examine the meaning of scarcity more closely. I test whether scarcity in a zero-sum mindset is characterized more by relative quantity or by finitude.

In Chapter 3, I test the hypothesis that zero-sum mindset can predict more specific zero-sum beliefs across a wide range of unrelated domains. Despite the growing literature on the causes and consequences of particular zero-sum beliefs about specific resources or relationships, research has yet to examine whether zero-sum thinking can also be understood as a stable, cross-domain, cross-situational, cross-cultural, individual difference. I test whether a zero-sum mindset can predict
specific zero-sum beliefs about unrelated social resources (e.g., empathy and jobs), and specific zero-sum beliefs about intergroup relationships in different cultural contexts (in the US, Pakistan, and India). In each study I compare the explanatory power of zero-sum mindset to other stable individual difference measures such as the Big Five personality trait measures and demographic variables such as sex, education, income, and age.

In Chapter 4, I consider whether a generalized tendency towards zero-sum thinking might give rise to stable patterns in cognitive motivations such that those with stronger zero-sum mindsets are more inclined to prefer simple, unambiguous modes of cognitive processing. To do this, I examine the relationship between zero-sum mindset and the need for cognitive closure across different cultural contexts (US, India, Pakistan). Just as in Chapter 3, I compare the explanatory power of zero-sum mindset to other stable individual difference measures such as personality and demographic characteristics. Furthermore, to examine whether changes in need for cognitive closure can alter zero-sum mindset, I experimentally manipulate the cognitive motivations (both increasing and decreasing need for closure) in a sample of UK residents.

In Chapter 5, I investigate whether a zero-sum mindset will predict a general tendency towards social cognitions consistent with being in a zero-sum situation. Specifically, I examine whether a zero-sum mindset will predict a stronger tendency to perceive hostility in others across domains and situations. First, I test whether an objectively zero-sum situation increases hostile attribution bias beyond the effect of competitive situations in general. Then, I also examine whether those with a zero-sum mindset will demonstrate social cognitions consistent with being in a zero-sum competition even in an explicitly non-zero-sum situation. Next, using a word-sentence association paradigm, I examine whether for those with a strong zero-sum mindset, such a hostile attributional style may operate at an implicit as well as explicit level of cognition.

In Chapter 6, I examine the role of zero-sum mindset in shaping one of the most important forms of social perception: trust. I test the hypothesis that zero-sum mindset predicts lower trust across a wide variety of unrelated domains in the US and Belgium. In Belgium, I collaborated with local government officials of a major city in Belgium to conduct a city-wide survey using a wide variety of recruitment techniques, including mailing an incentivized invitation to every physical address in the city. I also leverage panel data in the US using a repeated measures design and longitudinal growth curve models to test whether changes in zero-sum mindset over time predict changes in trust, or vice versa. I also examined whether a zero-sum mindset could predict behavioral trust using the classic trust game paradigm with incentives to win a real £100 cash prize.
In Chapter 7, I test the hypothesis that the general belief that success is zero-sum will predict lower cooperation. In particular, I examine whether zero-sum mindset predicts lower preference for cooperation as a strategic response to scarcity beyond the effect of personality variables or demographic characteristics. More importantly, I test this prediction in a real-world, high stakes situation in which cooperation could be a matter of life or death: the COVID-19 pandemic. Using panel data, I examined whether zero-sum mindset measured 8 months before COVID-19 could predict support for cooperation as a response to scarcity, and cooperation with public health efforts (operationalized as self-quarantining and social distancing) during the onset of the pandemic. I also tested the hypothesis in Belgium at a later stage in the pandemic, operationalizing cooperation with public health efforts as vaccination behavior.

In Chapter 8, I examine the downstream consequences of a zero-sum mindset for individual success. In a pre-registered prospective study, I test the hypothesis that zero-sum mindset will predict lower economic growth and lower subjective status over time. I also examine whether zero-sum mindset will predict lower overall satisfaction with one’s life.

In Chapter 9, I examine the consequences of a zero-sum mindset on collective success. More specifically, I test the hypothesis that a zero-sum mindset will predict anti-democratic attitudes, such as greater willingness to disenfranchise fellow citizens, as well as anti-democratic behaviors, such as greater likelihood of having used physical violence or intimidation to achieve political goals. Given the particular importance of voting as an expression of democratic participation and accountability, I more closely examine the relationship between zero-sum mindset and voting behavior (using both self-reported voting behavior in the US and Belgium, and objective voter turnout data from the 2020 US election). Finally, to examine whether the relationship between zero-sum mindset and commitment to democracy might extend beyond industrialized Western nations, I also examine the relationship between country-level zero-sum mindset and democratic functioning and risk of political violence.
Measuring Zero-Sum Mindset
Chapter 1

Measuring Zero-Sum Mindset

In this chapter, I briefly review the steps taken to develop a measure of zero-sum mindset by building on the work by Różycka-Tran, Boski, & Wojciszke (2015). In the 10 studies summarized below (four confirmatory factor analyses and six retest reliability analyses), I examined the following questions:

1. Are general zero-sum beliefs psychologically distinct from economic zero-sum beliefs?
2. Are zero-sum beliefs about intergroup relationships different from zero-sum beliefs about inter-individual relationships?
3. Is a zero-sum mindset stable over time?

Reexamining the BZSG

In order to investigate whether a general zero-sum belief that relationships are zero-sum can operate as a mindset that influences perceptions and behaviors across situations, I first sought to adapt the existing “Belief in Life as a Zero-Sum Game” (BZSG) scale for this purpose. The authors of this scale state that the “BZSG describes the economic domain” (Różycka-Tran et al., 2015). Accordingly, among the eight scale items, three describe economic zero-sum beliefs (e.g., “If someone gets richer it means that someone else gets poorer”), whereas the other five items describe general zero-sum beliefs about social relationships (e.g., “Life is like a tennis game–a person wins only when others lose”)

Table 1.1 displays original BZSG items.

My general hypothesis was that a belief that in general success is zero-sum should be considered distinct from the belief that economic success is zero-sum. Therefore, I predicted that the BZSG scale could be better understood as containing two dimensions: generalized zero-sum beliefs and economic zero-sum beliefs. Despite the clear conceptual distinction, one could easily imagine that this predicted difference is merely semantic. In other words, considering notions of human beings as “homo economicus” (Henrich et al., 2001), it may be the case that most people make no meaningful distinction between economic interests and their general interests. If so, people may be inclined to see the economic domain items and general relationship items as zero-sum in equal measure with similar relationships to other variables.
Table 1.1

<table>
<thead>
<tr>
<th>Original BZSG Scale Items</th>
<th>Modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Successes of some people are usually failures of others</td>
<td>1. The success of one person is usually the failure of another person.</td>
</tr>
<tr>
<td>2. Life is so devised that when somebody gains, others have to lose</td>
<td>2. Life is such that when one person gains, another person has to lose</td>
</tr>
<tr>
<td>3. In most situations interests of different people are inconsistent</td>
<td>3. In most situations, different people’s interests are incompatible</td>
</tr>
<tr>
<td>4. When someone does much for others he or she loses</td>
<td>4. When someone does much for others, they lose</td>
</tr>
<tr>
<td>5. Life is like a tennis game—a person wins only when others lose</td>
<td>5. Life is like a tennis game—a person wins only when another person loses</td>
</tr>
<tr>
<td>6. The wealth of a few is acquired at the expense of many*</td>
<td></td>
</tr>
<tr>
<td>7. If someone gets richer it means that someone else gets poorer*</td>
<td></td>
</tr>
<tr>
<td>8. When some people are getting poorer it means that other people are getting richer *</td>
<td></td>
</tr>
</tbody>
</table>

Note. Original items: Różycka-Tran, Joanna; Boski, Paweł; Wojciszke, Bogdan, 2015. * Indicates economic-domain items.

To test this, I examined the 43-nation BZSG dataset (Różycka-Tran, 2018). Using a multi-level confirmatory factor analysis (grouped by country), I compared the model fits for a unidimensional solution, and a two-factor solution which assigned the generalized belief items to one factor and the economic items to a second factor. In line with my hypothesis, the two-factor solution improved model fit ($\Delta \chi^2 = 952.89, p < .001$), reducing the Root Mean Square Error of Approximation (RMSEA) from .107 to .089, and increasing the Comparative Fit Index (CFI) from .926 to .952. Moreover, when examining country-level means of these separated scales using a paired sample t-test, economic zero-sum beliefs are significantly higher than generalized zero-sum beliefs ($t(42) = 2.66, d = .43, p = .01$), suggesting that across 37 countries, people are more inclined to see economic relationships as zero-sum than social relationships in general.

In Table 1.1, scale items are presented with the economic domain items grouped after the general domain items for clarity; however, the original BZSG scale mixes the order of these items throughout. While the two-factor model improved fit even when the economic items were interspersed with the general mindset items, the economic zero-sum belief statements may suggest that “success” should be interpreted to mean economic success when responding to the general zero-sum belief...
items. Put differently, reading statements about relationships framed in economic terms may prompt one to also be considering economic relationships when judging the other general items as well, making the intercorrelations higher than they might otherwise be.

Another feature of the BZSG is the variation in whether the items refer to an individual (e.g., “When someone does much for others, he or she loses”) or to broader groups in society (e.g., “The wealth of a few is acquired at the expense of the many.” While this variation likely captures a broad sense of one’s view of social relationships, it does not allow us to disentangle generalized zero-sum beliefs about interpersonal relationships and intergroup relationships.

From one perspective, zero-sum beliefs should be stronger at the individual level. In general, zero-sum situations are more likely to be truly zero-sum when more narrowly conceived. For example, when applying for a job, someone might be in real zero-sum competition against another person applying for the same particular job opening. However, it is unlikely to be the case that whole groups (e.g., immigrants and native-born citizens, or young people and older people) are competing in the job market in a truly zero-sum manner where any gain by one group corresponds to a direct, proportionate loss to another group. Yet, there might also be reason to expect discontinuity between zero-sum beliefs about individuals and zero-sum beliefs about groups. For example, a large body of research has demonstrated that people tend to view relationships between groups as more competitive than relationships between individuals, a phenomenon described as the “discontinuity effect” (Schoppe & Insko, 1992; Wildschut et al., 2003). Therefore, it may be that people will hold stronger zero-sum beliefs about group relationships than interpersonal ones.

To examine all of these hypotheses further, I conducted a pre-registered confirmatory factor analysis on a new sample (N = 821 US Residents, Table A1, Sample 1) with the scale modified (Table 1.1.) to improve clarity and to distinguish between interpersonal zero-sum beliefs (e.g. “The success of one person is usually the failure of another person”) and intergroup zero-sum beliefs (e.g. “The success of one group is usually the failure of another group”) and presented general zero-sum belief items prior to economic zero-sum belief items.

In this study, I found a large difference between the mean-levels of agreement on these generalized zero-sum belief items and the economically worded items such that economic domain zero-sum beliefs were significantly larger than generalized zero-sum beliefs in a paired samples t-test (t (820) = 23.8, p < .001, Cohen’s d = .83). The confirmatory factor analysis demonstrated that the two-factor model separating economically worded items and general zero-sum mindset items into separate dimensions achieved a significantly better model fit than the single factor model (Δχ² =
850.44, \( p < .001 \)), with the two-dimensional model achieving acceptable model fit indices \( (\chi^2 = 87.63, p < .001, \text{CFI} = 0.983, \text{RMSEA} = 0.066) \) and the single dimension model showing poor model fit \( (\chi^2 = 938.067, \text{CFI} = 0.775, \text{RMSEA} = 0.236) \) following the criterion suggested by Hu and Bentler (1999). This suggests that the 8-item BZSG might be better described as a two-dimensional measure of economic zero-sum beliefs and generalized zero-sum beliefs (CFA model depicted in Figure 1.1). Factor loadings from parallel analysis of 8 item scale presented in Tables 1.2 and 1.3). While it is likely that separating the items “spatially” within the survey may have sharpened the distinctions in factor loadings, this spatial separation does not explain the systematic differences in mean scores for these items, which consistently show stronger agreement with economic zero-sum beliefs compared to general zero-sum beliefs.

**Figure 1.1**

*Confirmatory Factor Analysis Separating General and Economic Zero-Sum Beliefs*

![Diagram](image)

*Note.* “Gnr” = general zero-sum belief factor, “Ecn” = economic zero-sum belief factor
Table 1.2

US Sample - Factor Loadings in Parallel Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>SD</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 5 – General</td>
<td>2.840</td>
<td>1.607</td>
<td>0.932</td>
<td>-0.054</td>
</tr>
<tr>
<td>Item 2 – General</td>
<td>3.153</td>
<td>1.655</td>
<td>0.858</td>
<td>0.044</td>
</tr>
<tr>
<td>Item 1 – General</td>
<td>3.074</td>
<td>1.629</td>
<td>0.798</td>
<td>0.072</td>
</tr>
<tr>
<td>Item 4 – General</td>
<td>2.725</td>
<td>1.600</td>
<td>0.746</td>
<td>0.005</td>
</tr>
<tr>
<td>Item 3 – General</td>
<td>3.468</td>
<td>1.503</td>
<td>0.661</td>
<td>-0.026</td>
</tr>
<tr>
<td>Item 8 – Economic</td>
<td>4.010</td>
<td>1.670</td>
<td>0.034</td>
<td>0.817</td>
</tr>
<tr>
<td>Item 6 – Economic</td>
<td>4.044</td>
<td>1.627</td>
<td>-0.013</td>
<td>0.665</td>
</tr>
<tr>
<td>Item 7 – Economic</td>
<td>4.910</td>
<td>1.602</td>
<td>-0.001</td>
<td>0.934</td>
</tr>
</tbody>
</table>

Note. N = 821. Applied rotation method is promax.

I also replicated this analysis in Italy with a sample of 278 participants (Table A1, Sample 5) and found very similar results (Table 1.3): poor model fit for the unidimensional solution ($\chi^2 = 324.64$, ...)
RMSEA = .235, CFI = .641) and a satisfactory fit for a two-factor model separating economic and
general zero-sum beliefs ($\chi^2 = 51.92$, RMSEA = .079; CFI = .961), which also corresponded a
significant improvement in fit ($\Delta \chi^2 = 272.72$, $p < .001$). Moreover, in a paired samples $t$-test, the
difference in ratings of economic zero-sum beliefs and generalized zero-sum beliefs were even more
pronounced in this sample ($t(275) = 20.99$, $p < .001$, $d = 1.26$).

**Table 1.3**

*Italian Sample Item Factor Loadings in Parallel Analysis*

<table>
<thead>
<tr>
<th>Item</th>
<th>$M$</th>
<th>$SD$</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General – 1</td>
<td>2.12</td>
<td>1.48</td>
<td>0.857</td>
<td>-0.040</td>
</tr>
<tr>
<td>General – 2</td>
<td>1.77</td>
<td>1.43</td>
<td>0.777</td>
<td>-0.025</td>
</tr>
<tr>
<td>General – 3</td>
<td>2.71</td>
<td>1.67</td>
<td>0.754</td>
<td>-0.076</td>
</tr>
<tr>
<td>General – 4</td>
<td>2.42</td>
<td>1.78</td>
<td>0.571</td>
<td>0.036</td>
</tr>
<tr>
<td>General – 5</td>
<td>2.71</td>
<td>1.68</td>
<td>0.534</td>
<td>0.075</td>
</tr>
<tr>
<td>Economic – 1</td>
<td>5.07</td>
<td>1.75</td>
<td>-0.110</td>
<td>0.716</td>
</tr>
<tr>
<td>Economic – 2</td>
<td>3.77</td>
<td>1.95</td>
<td>0.109</td>
<td>0.823</td>
</tr>
<tr>
<td>Economic – 3</td>
<td>4.05</td>
<td>1.82</td>
<td>0.037</td>
<td>0.797</td>
</tr>
</tbody>
</table>

*Note.* N = 278. Applied rotation method is promax.
To propose that the BZSG may be better understood as a two-dimensional measure does not imply that it has not achieved precisely what its authors set out to measure: the belief that “success, especially economic success” is zero-sum. Indeed, the suggestion that the economic items in the scale activate economic interpretations of the other items is, presumably, what the authors intended. However, in order to measure truly generalized beliefs not particular to the economic domain, separating these items is an important part of this endeavor.

Though the BZSG and the modified version I have adopted to measure zero-sum mindset should, of course, be highly correlated, they also differ in meaningful ways. For example, zero-sum beliefs about the economy can be inversely related to zero-sum beliefs about social hierarchies (Davida & Ongis, 2019) and economic schemas suggest particular behavioral norms that do not apply to other domains of success (Liberman et al., 2004). Indeed, in this sample I found that generalized zero-sum beliefs were related to cognitive style (need for cognition: $r = -.33, p < .001$) while economic zero-sum beliefs were not ($r = -.05, p = .55$). Moreover, zero-sum mindset and economic zero-sum beliefs had opposite relationships to social dominance orientation, with zero-sum mindset predicting higher social dominance ($r = .35, p < .001$), while zero-sum beliefs about economic relationships predicted lower social dominance ($r = -.08, p = .025$). Furthermore, these opposing relationships with social dominance become even stronger when included together in a multiple linear regression that accounts for their shared variance (general zero-sum beliefs: $\beta = .51, p < .001$; economic zero-sum beliefs: $\beta = -.32, p < .001$). In other words, since previous research using the BZSG largely describes the relationship between zero-sum beliefs about economic success and other phenomena, how these psychological phenomena (such as trust and subjective wellbeing) will relate to a fully generalized measure of zero-sum beliefs remains untested.

Reverse-Key Items

In addition to these modifications, I also sought to develop “reverse-key” items to help mitigate the effect of response biases such as acquiescence. Acquiescence is the general tendency to rate stronger agreement with a statement regardless of its content (Soto & John, 2017). Therefore, relationships between any two measures that do not include any reverse-key items are more likely to be positively correlated without regard to the scale’s content, potentially suppressing real negative relationships or inflating positive relationships between variables.

---

1 Some of this development took place in parallel with the earliest studies. Therefore, Studies in 2018 and 2019 do not include the reverse-key items while the remaining studies 2020-2022 use the 7-item scale with two reverse-key items included.
Yet, describing the polar opposite of a zero-sum game proves to be more complex than it may at first appear. Despite the natural intuition that the opposite of a zero-sum game is a positive-sum game, previous research on zero-sum beliefs has consistently found that these beliefs appear to be largely orthogonal (Różyczka-Tran et al., 2015; Stefaniak et al., 2020). In the same way that positive and negative affect (which are intuitively opposite of one another and indeed generally negatively correlated) have been found to be distinct dimensions, the opposite of a zero-sum game isn’t necessarily a positive-sum game. Rather, the polar opposite of a zero-sum game can only be described as a non-zero-sum game, which entails the entire variety of variable sum outcomes (negative-sum, positive-sum, as well as independent outcomes in general). Therefore, two simple negation reverse-key items (e.g., “One person’s success is not another person’s failure) were added to the original five items adapted from the BZSG for a final scale of seven items. Confirmatory factor analysis of this final scale ($N = 499$; Table A1, Sample 4) reveals a good fit ($\chi^2 = 31.596, p < .001$, RMSEA = .071, CFI = .984). Internal reliability for this final measure is also consistently high ($\alpha = .85, \omega = .86$). Throughout this investigation, which seeks to examine zero-sum mindset as a cross-situational, cross-domain phenomenon, I utilize the modified version of the general zero-sum belief dimension of the scale, which I refer to as zero-sum mindset.

In the US sample (Table A1, Sample 1), improved model fit was also found in a confirmatory factor analysis separating general zero-sum beliefs about group relationships and economic beliefs about group relationships ($\Delta \chi^2 = 995.783, p < .001$). Unlike the economic beliefs, which differed strongly from general zero-sum beliefs both in magnitude and in predictive value for various socio-cognitive variables, general zero-sum beliefs about group relationships demonstrated the same relationships with other variables as zero-sum beliefs about individual relationships. Therefore, in most instances where parsimony is desired throughout this investigation, I use only the interpersonal measure of zero-sum mindset.

Although, it is interesting to note that while demonstrating similar patterns as beliefs about interpersonal relationships, I found that in the US people tend to rate group relationships as more zero-sum than individual relationships ($t(820) = 9.89, d = .21$ in a paired samples t-test). While this result has replicated in other samples in the US, and the UK, and in one sample in Belgium ($ps <.001$), it did not replicate in a separate Belgian sample ($p = .18$), or in Italy ($p = .65$) or India ($p = .19$) even

---

4 In early attempts to develop reverse-key items, I also found that the positive-sum items (e.g., “What helps one person usually benefits others as well”) loaded starkly onto a separate (negatively correlated) factor while only the “simple negation” reverse-key items (e.g., “One person’s success is not another person’s failure”) loaded negatively onto the main factor (loadings > .6). This is consistent with other research that has found positive-sum beliefs to be a distinct dimension from zero-sum beliefs (Różyczka-Tran et al., 2015; Stefaniak et al., 2020).
though the direction of the effect was consistent in each sample. This suggests that there may be cultural differences in the tendency to see group relationships as more zero-sum than interpersonal ones. While the number of countries observed here are too few to draw definitive conclusions about the nature of those cultural differences, we know that the US is an outlier in its degree of strident individualism (Fischer, 2008; Triandis & Gelfand, 1998). Therefore, it may be that such differences between thinking about interpersonal and group relationships as zero-sum emerge in highly individualistic cultures and to a lesser extent in more collectivist cultures. Future research should examine this more directly.

Table 1.4

Final Items Used to Measure Zero-Sum Mindset (Interpersonal)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The success of one person is usually the failure of another person.</td>
</tr>
<tr>
<td>2.</td>
<td>Life is such that when one person gains, someone else has to lose.</td>
</tr>
<tr>
<td>3.</td>
<td>When someone does much for others, they lose.</td>
</tr>
<tr>
<td>4.</td>
<td>In most situations, different people's interests are incompatible.</td>
</tr>
<tr>
<td>5.</td>
<td>When one person is winning, it does not mean that someone else is losing. (R)</td>
</tr>
<tr>
<td>6.</td>
<td>Life is like a tennis game--A person wins only when another person loses.</td>
</tr>
<tr>
<td>7.</td>
<td>One person’s success is not another person’s failure. (R)</td>
</tr>
</tbody>
</table>

*Note.* (R) = reverse-key items.

Table 1.5

Final Items Used to Measure Zero-Sum Mindset (Intergroup)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The success of one group is usually the failure of another group.</td>
</tr>
<tr>
<td>2.</td>
<td>Life is such that when one group gains, another group has to lose.</td>
</tr>
<tr>
<td>3.</td>
<td>When one group does much for others, they lose.</td>
</tr>
<tr>
<td>4.</td>
<td>In most situations, different groups’ interests are incompatible.</td>
</tr>
</tbody>
</table>
5. When one group is winning, it does not mean that another group is losing. (R)

6. Life is like a football game--A group wins only when another group loses.

7. One group’s success is not another group’s failure. (R)

**Note.** (R) = reverse-key items.

**Stability Over Time**

I also examined the stability of a zero-sum mindset by repeating measures with the same participants over periods of a few days, a few weeks and several months. Retest reliability statistics are presented in Table 1.6.

**Table 1.6**

Zero-Sum Mindset Retest Reliability - Intraclass Correlation Coefficients

<table>
<thead>
<tr>
<th>Year (T1) - Sample</th>
<th>N</th>
<th>Time Between Measures</th>
<th>ICC</th>
<th>ICC 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>418</td>
<td>5 days</td>
<td>.82</td>
<td>[.78, .84]</td>
</tr>
<tr>
<td>2022</td>
<td>233</td>
<td>2 weeks</td>
<td>.83</td>
<td>[.79, .87]</td>
</tr>
<tr>
<td>2020</td>
<td>292</td>
<td>2 weeks</td>
<td>.91</td>
<td>[.90, .93]</td>
</tr>
<tr>
<td>2019</td>
<td>337</td>
<td>8 months (pre/post COVID)</td>
<td>.78</td>
<td>[.75, .81]</td>
</tr>
<tr>
<td>2018</td>
<td>353</td>
<td>9 months</td>
<td>.82</td>
<td>[.78, .85]</td>
</tr>
<tr>
<td>2020</td>
<td>265</td>
<td>9 months</td>
<td>.77</td>
<td>[.71, .81]</td>
</tr>
</tbody>
</table>

Note. N = number of unique participants measured at 2 timepoints. ICC estimates and their 95% confidence intervals were calculated using R statistical package version 4.0.2, based on a mean-rating (k = 7), absolute-agreement, 2-way mixed-effects model.

Similar studies of measures of personality have revealed that up to 25% of variance in short-term retest measures might be attributable to transient error, and that differences beyond this over longer periods of time may reflect real changes over time (Chmielewski & Watson, 2009). Changes in relatively stable traits may also occur in the aftermath of psychologically dramatic events, both for individual experiences and collective experiences of upheaval. The onset of the COVID-19 pandemic which sent societies around the globe into a heightened state of uncertainty represented
such an event. Yet, even in this tumultuous period, zero-sum mindset was remarkably stable. The intra-class correlation between pre-pandemic (T1 = July 2019) and early pandemic (T2 = March 2020) was .78, and a repeated measurement two weeks later (T3 = April 2020) was also stable (ICC T2 to T3 = .91). (See Chapter 6, Study 6E for analyses using time varying growth models of zero-sum mindset during this period).

On Zero-Sum Mindset and Personality Traits

Measures of personality are typically considered the most important predictor of cross-situational attitudes and behaviors since such measures are, by definition, meant to measure concepts of the self without regard to a particular situation. Furthermore, the universality of the five-factor model (“The Big Five”) has now been demonstrated in countless studies in a plethora of countries, and with some evidence of biological origins (McCrae & Costa, 1997; Power & Pluess, 2015). However, when it comes to predicting behavior across situations, research also demonstrates that Westerners are particularly inclined to use personality information, about themselves or others to explain behavior. Whereas non-Westerners of many cultural varieties are more inclined to use information about the relationship between things and people, and information about the situation, to form coherent “situationally-stable” or “relationally-stable” judgments (Heine & Buchtel, 2009).

Since a zero-sum mindset is, by definition, a belief about one’s environment, it is not immediately obvious whether or not it should demonstrate stable relationships with people’s beliefs about themselves as rated in self-evaluations of cross-situational personality traits. In Chapters 3 and 4, I compare the ability of zero-sum mindset and personality traits to predict variables such as cognitive style and beliefs and attitudes about a conflicted intergroup relationship in both Western and non-Western countries (US, Pakistan, and India). While I found consistent patterns in the relationship between zero-sum mindset and all of these outcome variables in each country, personality measures demonstrated no such stable cross-cultural predictive ability. In fact, in many cases traits predicted outcomes in the opposite way that would be expected from a Western viewpoint. For example, while zero-sum mindset predicted greater willingness to use hostility against an outgroup in both the US and Pakistan, trait agreeableness negatively predicted such hostility in the US and positively predicted such hostility in Pakistan. While this finding was at first surprising, upon further reflection, it makes sense that what it means to be “agreeable” with others will vary dramatically based on what most others around you consider to be “agreeable,” even willingness to fight a shared outgroup. However, unlike beliefs about the self, a belief in a zero-sum relationship should bear the same strategic implications across cultures.
Indeed, some have argued that reframing personality in terms of patterns of strategic responses to challenges in our environment may help integrate broader anthropological and evolutionary perspectives in our understanding of individual differences (Buss, 2009; Heine & Buchtel, 2009). To this end, understanding stable individual differences in perceptions of the structure of incentives in our environments, such as a zero-sum mindset, may be particularly constructive for its tighter, natural connection to strategic responses.

**Discussion**

This chapter reviewed the steps taken to validate a modified version of the BZSG scale in order to measure zero-sum mindset. In three confirmatory factor analyses, I found strong evidence that the BZSG can be understood as a two-dimensional scale that includes both general, global beliefs that success is zero-sum, and a separate dimension which captures zero-sum beliefs about the economic domain. In modifying the scale to distinguish between zero-sum beliefs about relationships between groups and individuals, I found evidence suggesting that some people may see group relationships as more zero-sum than interindividual relationships, but also that this effect may only occur in highly individualistic cultures like the United States. Reverse-key items were added to the scale to help balance for acquiescence, and the unidimensional factor structure of the final 7-item scale was also confirmed. Finally, in six samples comprising 1,898 unique participants with repeated measures (n = 4,275 total observations), and time between measurements ranging from five days to nine months, I found robust evidence that the general belief that success is like a zero-sum game is relatively stable over time.
II

Conceptualizing Zero-Sum Mindset
Chapter 2

Zero-Sum Mindset and Generalized Beliefs About the World

If life were a zero-sum game, what would such a world be like? A zero-sum game has two essential features that may shape what the world is like for those with a zero-sum mindset: 1. Rewards exist in a fixed amount. 2. Players’ interests are antagonistically interdependent.

Perhaps the most essential feature of a zero-sum game is the “fixed sum” nature of winnings or rewards. In other words, that which makes you successful in the game exists in a finite, limited amount. This means that, unlike other games, value cannot be created or generated. To see the world through this lens would suggest a belief that the world is characterized by a fixed amount of success or valuable resources, and importantly, that this situation cannot be improved through cooperation or creativity.

Another essential implication of playing a “fixed sum” game in which value cannot be created is that success cannot be shared through cooperation. While many other games are considered “cooperative games” or “mixed motive” games, a zero-sum game is one of the only game theoretical structures that contains no cooperative elements whatsoever (Raghavan, 2012). In a zero-sum game, success is relative, not absolute. That is, to win a zero-sum game does not require winning any particular amount, it requires earning relatively more than the other players. Applying this structure of success to beliefs about the world may imply a view of the social world as a narrow hierarchy, where success is ordered from top to bottom. Furthermore, in a world where one must pull others down in order to succeed, life becomes a brutal contest rather than a cooperative enterprise.

Following from this view of the world where one can only be successful at the expense of others, a zero-sum view of life may also imply that others who wish to be successful will try to harm you rather than help you. Since such a world is more likely to reward brutality rather than kindness, those with a zero-sum mindset may also be more likely to see the world as a dangerous place with little justice for those who do right or wrong.

Therefore, if a zero-sum mindset is a generalized implicit belief about how the world works, it should be related to other stable, general beliefs about “life” and “the world.” More specifically, as a generalized belief that life is like a zero-sum game, a zero-sum mindset should also predict beliefs about the world that are logically consistent with being in a zero-sum situation.
Study 2

Drawing upon recent research by Clifton and colleagues (Clifton et al., 2019) who developed a 99-item inventory to capture what they call “Primal World Beliefs,” I investigated whether a zero-sum mindset would predict primal world beliefs that cohere with the implications outlined above. From among the full inventory, I measured eight primal world beliefs that most nearly corresponded, often in a negative direction, to the features of a zero-sum game: abundant (vs. scarce), cooperation (vs. competition), changing (vs. static), improvable (vs. too hard to improve), hierarchical (vs. nonhierarchical), harmless (vs. dangerous), just (vs. unjust), and interconnected (vs. atomistic).

This study had three main goals: Firstly, to examine whether zero-sum mindset relates to primal world beliefs in a way that is coherent with being in a zero-sum game. Secondly, to test whether zero-sum mindset might be reducible to any one primal belief. For example, zero-sum thinking is often described as synonymous with competitiveness. If holding a zero-sum mindset is nothing more than a competitive view of the world, then this primal world belief may account for all of the variance in zero-sum mindset when included in the same model as the other primal world beliefs. If so, the concept of a zero-sum mindset may not contribute more to our understanding of how a general belief about one’s environment can shape behavior beyond this primal belief in competitiveness. Thirdly, if a zero-sum mindset is not reducible to a single primal world belief, then this study also seeks to identify which primal beliefs are most essential to what it means to see life as a zero-sum game.

In addition to primal world beliefs, I also examine specific beliefs about the meaning of scarcity more closely. One of the most salient features of a zero-sum game is the scarcity of rewards. However, scarcity is often defined in two inter-related, but distinct ways. Firstly, people often use the term scarcity to refer to something that exists in small or inadequate quantity. Secondly, scarcity refers to something that exists in a finite amount, independent of its quantity (Merriam-Webster, 2022; Oxford English Dictionary, 2022). While both definitions may lead to the experience of scarcity, these differences may point to different strategic implications for how to deal with scarcity. For example, when resources are small, but not fixed, one might turn to the cooperative strategies often needed to foster growth. Whereas, if resources are small and fixed, one might turn to competitive, maybe even hostile, strategies required to obtain a limited good. Strictly speaking, the scarcity implied by a zero-sum game aligns more closely to the latter definition in which the sum is fixed regardless of whether that sum is small or large. Therefore, when thinking about the meaning of scarcity as a belief about the world, a zero-sum mindset should be particularly related to a notion of scarcity characterized by its finitude rather than its quantity.
Method

Participants and Procedure

Four hundred and ninety-nine US residents recruited on the Prolific platform provided informed consent and completed the survey which required passing all attention checks. Sixty-six percent of participants identified as white/Caucasian, 7% as Latinx/Hispanic, 7% as East Asian, 7% as black/African American, 2% as South Asian, 1% as Middle Eastern, and 5% as mixed race, and 5% as other. Fifty-four percent of participants identified as female, 42% as male, and 4% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, \( M_{\text{age}} = 33.67, SD = 12.33 \). (Table A1, Sample 4).

Measures

Zero-Sum Mindset

Zero-sum mindset was measured using a 7-item scale based on the BZSG (development described in Chapter 1) which measures general beliefs that life and success are like a zero-sum game. (e.g., “Life is like a tennis game--A person wins only when another person loses”) including reverse-key items (e.g., “One person’s success is not another person’s failure”). Responses rated on a scale from 1 - Strongly disagree to 7 - Strongly agree (\( \omega = .87 \)).

Primal World Beliefs

To measure basic beliefs about what the world is like, I used the Primal World Belief Inventory measures (Clifton et al., 2019) for beliefs that the world is characterized by abundance, cooperation, changing, improvability, hierarchy, harmlessness, justice, and interconnection. The primal belief in abundance (“e.g., Life overflows with opportunity and abundance”) is contrasted with belief in scarcity (“The world feels like a barren place with few opportunities”) in a 4-item scale, \( \omega = .78 \). Belief in cooperation (“Instead of being cooperative, the world is a cut-throat and competitive place”) is contrasted with brutal competition (“Instead of being cooperative, life is a brutal contest where you got to do whatever it takes to survive”) in a 4-item scale, \( \omega = .82 \). Belief in a changing world (“Everything feels like a whirl of constant change”) is contrasted with a static world (“The world is a place where most things stay pretty much the same”), in a 4-item scale, \( \omega = .87 \). Belief in improvability (“In most situations, making things way better is absolutely possible”) is contrasted with improvement as unattainable (“Most situations seem really difficult if not impossible to improve”) in a 4-item scale, \( \omega = .76 \). Belief in hierarchy (“Things are rarely equal. Most plants and
animals, and even people, are better or worse than one another”) is contrasted with non-hierarchy (“Most things aren’t better or worse. It’s hard to organize the world into hierarchies, rankings, or pecking orders that reflect true differences”) in a 5-item scale, $\omega = .86$. Belief in a harmless world (“I tend to see the world as pretty safe”) is contrasted with belief in a dangerous world (“On the whole, the world is a dangerous place”) in a 5-item scale, $\omega = .90$. Belief in a just world (“If someone is generous and kind, the world will be kind back”) is contrasted with belief in an unjust world (“The world is a place where we rarely deserve what we get.”) in a 5-item scale, $\omega = .80$. Belief in an interconnected world (“Though things can appear separate and independent, they really aren’t. Instead, all is one”) is contrasted with a world where things are independent of one another (“Most things are basically unconnected and independent from each other”) in a 4-item scale, $\omega = .88$. All scales included at least one reverse-key item and were rated on a scale from 1 - Strongly disagree to 6 - Strongly agree.

The Meaning of Scarcity

To measure beliefs about the meaning of scarcity, participants rated five Likert-style items ($\omega = .76$) about the extent to which they see resources or value as fixed regardless of their current amount (e.g., “The amount of resources in the world is not fixed. More can be created” (reverse-scored), “Value cannot be created or destroyed, just gained or lost”), and four items ($\omega = .91$) about the degree to which they see resources as lacking in supply regardless of whether they are fixed (e.g., “The existing amount of resources in the world is sufficient” (reverse-scored), “In general, there are not enough resources to go around”). Responses options ranged from 1 - Strongly disagree to 6 - Strongly agree.

Big Five Personality Traits

To control for personality traits, I used the Big Five Short Scales (Soto & John, 2017). Full 12-item scales with four items for each of the three sub-facets were measured for agreeableness ($\omega = .81$; $\omega_{trust} = .73$, $\omega_{respect} = .67$, $\omega_{compassion} = .65$) and neuroticism ($\omega = .93$; $\omega_{vulnerability} = .86$, $\omega_{depression} = .86$, $\omega_{anxiety} = .82$). Conscientiousness, openness, and extraversion were measured using brief three-item scales ($\omega = .74$, $\omega = .59$, $\omega = .70$).

Demographic Variables

To control for demographic variables, participants reported their age, sex, income, and education levels.
Results

To investigate the relationship between zero-sum mindset and primal world beliefs, I first examined their zero-order correlations. The observed pattern of relationships was highly coherent with a zero-sum view of the world (Table 2.1) such that those who see the world as a zero-sum game were also more likely to see the world as a place characterized by: scarcity (vs. abundance) -- “a barren place with few opportunities”, hierarchy– a place where nearly everything “can be ranked in order of importance,” injustice – “a place where we rarely deserve what we get,” competition (vs. cooperation)-- “a brutal contest where you have to do whatever it takes to survive”, danger (vs. harmless)-- where “real danger is everywhere”, and unimprovability–where “most situations seem really difficult if not impossible to improve.”

Next, I investigated whether zero-sum mindset might be reducible to any single primal world belief. When entering all primal beliefs into a single multiple regression model, primal beliefs in scarcity (vs. abundance), hierarchy, competition (vs. cooperation), and rigidity (vs. improvability) all remained significant predictors of zero-sum mindset ($\beta < .02$), while beliefs in a just, harmless, and interconnected world became non-significant ($\beta > .13$). Analyzing this a different way, I also conducted a lasso (least absolute shrinkage and selection operator) regression, which uses cross-validation to reduce overfitting to a particular dataset by randomly selecting a share of the data to train the model (in this case 80%), and then testing these model predictions against the remaining data (McNeish, 2015; Tibshirani, 2011). Lasso regression informs model selection by shrinking coefficients of relatively unimportant variables to zero. In this analysis, all measured primals, along with all Big Five personality traits and demographic variables (age, sex, education, income) were included in the lasso regression predicting zero-sum mindset. These results also indicated that zero-sum mindset was best predicted by primal beliefs in scarcity, hierarchy, low cooperation, and low improvability–all essential features of a zero-sum situation. Importantly, zero-sum mindset is not fully explained by any single primal world belief (or personality variable), but rather each belief contributes meaningfully to what it means to see life as a zero-sum game.

I also examined beliefs about the nature of scarcity to test whether the notion of scarcity within the zero-sum mindset might be particularly characterized by finitude (existing in a fixed amount) or by relative supply (currently existing in an inadequate amount). While both fixed scarcity and quantity scarcity beliefs were significantly correlated with a zero-sum mindset ($r = .29$ and .14 respectively, $p < .001$), when including both in a linear regression model to account for their shared variance, only the belief in fixed scarcity remains little changed ($\beta = .27, p < .001$) while the belief in quantity scarcity becomes non-significant ($\beta = .07, p = .12$). Zero-sum mindset also predicts this
belief in fixed scarcity when controlling for all Big Five personality variables as well as income, education, sex, and age ($\beta = .24, p < .001$).
\[ 100' > d = *** 10' > d = **** 0.5' > d = \star \star \star \] Note: Values in square brackets indicate the 95% confidence interval for each correlation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>SD</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Zero-sum indices of framed world beliefs - Means, standard deviations and correlations with confidence intervals

Table 2.1
Discussion

In this study, I found that seeing life like a game where in order for one person to win someone else must lose, predicted other general beliefs about what the world is like that were consistent with seeing life as a zero-sum game. Those with stronger zero-sum mindset were more likely to see life as scarce, hierarchical, unjust, uncooperative, dangerous, unimprovable and atomistic. It is interesting to note that zero-sum mindset was unrelated to seeing the world as “changing,” but negatively related to “improvability.” In other words, while change might be possible in a zero-sum world, that is, value may be gained or lost, growth is not possible. Therefore, improvement is unlikely. The only primal world belief that did not relate to zero-sum mindset in an expected way was “interconnected.” This may be because the language of connection in these items implies solidarity (e.g., “Though things can appear separate and independent, they really aren’t. Instead, all is one.”), whereas interconnection in a zero-sum world would imply that all things are antagonistically interconnected. Future research may wish to examine this difference between harmonious interconnection and antagonistic interconnection and independence more closely.

Furthermore, when using multiple regressions and regularized lasso regression techniques to reduce the model to only those primal beliefs with unique explanatory power, I found that a zero-sum mindset is still characterized by scarcity, hierarchy, competition, and intransigence to improvement. Whereas, perceptions of unfairness and danger may not be primary components of a zero-sum mindset, but perhaps, secondary implications that follow from it (as will be demonstrated in Chapters 5 and 6).

When one holds such general beliefs about how the world works, they bring these beliefs to every new domain and situation they encounter. In general, this will mean that those with a zero-sum mindset will be more likely to construe success in any given situation as a fixed, scarce resource that cannot be fostered through cooperation. In other words, they may be inclined towards zero-sum thinking in every new situation. Therefore, another way this mindset may manifest across situations is by predisposing someone towards specific zero-sum beliefs across domains and situations.
III

Zero-Sum Beliefs Across Domains
Chapter 3

Predicting Specific Zero-Sum Beliefs Across Unrelated Domains

Given their important implications, the causes and consequences of zero-sum beliefs have been studied across a wide variety of domains.

In the economic domain, research finds that the zero-sum belief that economic success is zero-sum can emerge from one’s perception of relative deprivation (Ongis & Davidai, 2021), and can reduce helping behavior in the workplace (Chernyak-Hai & Davidai, 2022; Sirola & Pitesa, 2017). Zero-sum beliefs about market exchanges tend to be stronger for bartered exchanges rather than buy-sell transactions and may be exacerbated by failures in perspective-taking (Johnson et al., 2022). Zero-sum beliefs about the job market reduce support for programs designed to support new immigrants (Esses et al., 1998, 2001). Zero-sum beliefs about negotiations (e.g., Fixed pie bias) lead to suboptimal outcomes for negotiators (Bazerman, 1983).

In intergroup contexts, previous research finds that high status groups who feel threatened are more likely than low-status groups to see their relationship as a zero-sum game (Norton & Sommers, 2011; Wilkins et al., 2015) and such zero-sum beliefs reduce support for egalitarian efforts (Brown et al., 2022). For example, zero-sum beliefs about gender relations in the workplace reduce support for policies that promote gender equity (Kuchynka et al., 2018). Zero-sum beliefs about diversity policies in universities reduce support for those policies even when they benefit majority and minority groups together (Brown & Jacoby-Senghor, 2021). Zero-sum beliefs about the relationship between high and low status groups reduce support for equality efforts, and lower support for allyship and collective action (Stefaniak et al., 2020). Zero-sum beliefs about the relationship between Christians and the LGBTQ community predict strong sexual-orientation-based prejudice and lower support for marriage rights (Wilkins et al., 2022). Indeed, the belief that social status in general is like a zero-sum game promotes a desire for dominance and willingness to use intimidation-based strategies to get ahead (Andrews Fearon, 2022).

While the growing literature on zero-sum beliefs has remained largely fragmented and situated within specific domains, even a cursory review of the literature reveals consistent patterns of the effects of zero-sum beliefs: and tendency towards hostility instead of cooperation, and dominance instead of equality. In other words, wherever they emerge, zero-sum beliefs stifle cooperation towards collective interests. Whether these zero-sum beliefs pertain to material resources such as wealth, symbolic or abstract social resources such as status or discrimination, zero-sum beliefs are commonly
understood as being highly contextualized and sensitive to one’s motives within a given domain or situation (Roberts & Davidai, 2021). Perhaps for this reason, research has not yet investigated what, if anything, might predict a tendency to hold zero-sum beliefs across domains and situations.

In Chapter 1, I found that economic zero-sum beliefs were correlated with, but distinct from, generalized zero-sum beliefs. Similarly, Wilkins et al. (2015) report a very high correlation between “global zero-sum beliefs” (a general view of intergroup relationship as zero-sum) and specific zero-sum beliefs about the relationship between men and women, but they also demonstrated that this generalized zero-sum belief was not affected by a situational manipulation that altered the specific zero-sum belief about gender relations. This suggests that specific zero-sum beliefs do not necessarily lead to general zero-sum beliefs; However, it has yet to be examined whether a generalized belief that success is zero-sum might predict many kinds of specific zero-sum beliefs across unrelated domains. I propose that a zero-sum mindset, when conceived as a truly generalized view of life as a zero-sum game (that is, not merely the belief that economic success is zero-sum) will predict specific zero-sum beliefs across a variety of unrelated domains and situations.

**Studies 3A - 3D**

In Study 3A I examine whether a zero-sum mindset can predict zero-sum beliefs about very different kinds of resources, both symbolic (empathy) and material (jobs). In Studies 3B - 3D, I examine whether zero-sum mindset can predict zero-sum beliefs about specific social relationships across different cultural contexts. In all studies, I compare the explanatory power of zero-sum mindset to a host of other important stable variables including measures of personality, and demographic variables.

**Study 3A Methods**

**Participants and Procedure**

Study 3A utilizes the same sample and procedure used in Study 2 (N = 499 US Residents recruited on Prolific). Sixty-six percent of participants identified as white/Caucasian, 7% as Latinx/Hispanic, 7% as East Asian, 7% as black/African American, 2% as South Asian, 1% as Middle Eastern, and 5% as mixed race, and 5% as other. Fifty-four percent of participants identified as female, 42% as male, and 4% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, \( M_{\text{age}} = 33.67, \ SD = 12.33\). (Table S1, Sample 4).
Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - Strongly disagree to 7 - Strongly agree.

Domain-Specific Zero-Sum Beliefs

Measures of specific zero-sum beliefs captured zero-sum beliefs across a variety of unrelated domains including economic resources like jobs (e.g., “When one person gets a job, it means that someone else loses a job”, two items, \( r = .63 \)), social emotions like empathy (e.g. “When one person receives more empathy it usually means less empathy for another person”, four items, \( \omega = .91 \)) and forms of social influence like status (e.g. “When status for one person is increasing it means that status for another person is decreasing,” 2 items, \( r = .70 \)) and respect (e.g., “when respect for one person is increasing it means respect for another person is decreasing.” two items, \( r = .82 \)). Participants rated agreement with items on a scale from 1 - Strongly disagree to 7 - Strongly agree.

The Big Five Personality Traits

Personality traits were measured using the Big Five scales used in Study 2.

Primal World Beliefs

Primal world beliefs were measured using the same scales used in Study 2.

Demographic Variables

To control for demographics, participants reported their age, sex, income, and education.

Study 3A Results

To test the hypothesis that a zero-sum mindset predicts specific zero-sum beliefs across unrelated domains, I first examined the zero-order correlations between zero-sum mindset and a variety of specific zero-sum beliefs. As predicted, zero-sum mindset was strongly correlated with all specific zero-sum beliefs (\( rs \) ranged from .48 to .63, \( M_r = .58 \), all \( p < .001 \)), even though, as we would
expect for such different domains, these beliefs differed significantly from one another (repeated measures ANOVA: $F(3,498) = 119.01, p < .001$).

I also tested whether zero-sum mindset might account for domain-specific zero-sum beliefs over and above other stable measures such as personality and demographic variables. When combining all domain-specific zero-sum beliefs into a single composite score (all zero-sum beliefs $\omega = .93$), zero-sum mindset alone accounted for 45% of the variance (Adj. $R^2$) in a simple linear regression. Adding all Big Five personality traits and demographic variables (age, sex, income, education) to the model only added an additional 4% of total variance explained compared to just zero-sum mindset alone (Table 3.1). Similar results were found when including primal world beliefs in the model. Adding these eight additional parameters only explained an additional 8% of variance beyond the 45% explained by zero-sum mindset alone.
100' > d = *** 10' > d = ** 5' > d = * d = +

Standardized regression weights. p represents the semi-partial correlation squared. Represents the zero-order correlation. Note, N = 499. A significant p-value indicates the beta-weight and semi-partial correlation are also significant. p Represents unstandardized regression weights. May indicate the

<table>
<thead>
<tr>
<th>Model 2</th>
<th>95% CI [3.9, 15]</th>
<th>R² = 0.453</th>
<th>67'</th>
<th>Zer-o-Sum Mindest</th>
<th>0.79'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>95% CI [1.8, 5.1]</td>
<td>R² = 0.48</td>
<td>5'</td>
<td>Zer-o-Sum Mindest</td>
<td>0.74'</td>
</tr>
</tbody>
</table>

Regression results predicting domain-specific zero-sum beliefs.

Table 3.1
Studies 3B - 3D

In Study 3A, I found that zero-sum mindset predicted specific zero-sum beliefs across unrelated domains such as the zero-sum beliefs about empathy and the job market. Despite significant differences in the strength of zero-sum beliefs between the domains, intercorrelations of within-person ratings of the zero-sum beliefs were high (average inter-item correlation = .59), further suggesting the possible role of an individual underlying tendency toward zero-sum thinking. Moreover, zero-sum mindset accounted for nearly half of the variance in these specific zero-sum beliefs, with personality traits and demographic differences contributing relatively little. This suggests that understanding individual differences in zero-sum mindset, over and above differences in one’s personality, demographic characteristics, or even the particular belief domain, may be an essential part of understanding zero-sum beliefs. Next, I examine whether zero-sum mindset can also predict zero-sum beliefs about relationships in real social conflict contexts, such as beliefs about relationships between members of different groups in a society, or between members of societies.

In Study 3B, I examine whether zero-sum mindset will predict stronger zero-sum beliefs about the relationship between members of different political groups in the United States. In other words, I hypothesize that the general belief that success is zero-sum will also predict the belief that conservatives and liberals, democrats and republicans in the United States cannot be successful together, and that anything that helps members of one group necessarily harms the other. In Study 3C and 3D, I replicate this hypothesis in another cultural context, examining whether zero-sum mindset will predict zero-sum beliefs about the relationships between Indians and Pakistanis. In each of these studies, I also test whether zero-sum mindset will predict zero-sum beliefs about specific social relationships even when controlling for demographic variables, personality traits, and cognitive style.

Study 3B - 3D Method

Participants and Procedure

Study 3B

Five-hundred and six US residents recruited on Amazon’s Mechanical Turk to participate in Study 2B provided informed consent, passed attention checks, and completed the survey. Fifty-five percent identified as male, 45% as female. Sixty-nine percent identified as white/Caucasian, 13% as black/African American, 6% as Asian, 5% as Latinx/Hispanic, 5% as mixed ethnicity, and 2% as other. Ages ranged from 20 to 76. $M_{age} = 40.05$, $SD = 11.68$. (Table A1, Sample 6).
Study 3C

Three-hundred and five Indian residents recruited on Amazon’s Mechanical Turk to participate in Study 3C gave informed consent, passed attention checks and two English language comprehension checks, and completed all measures. Seventy-seven percent of participants identified as male and 23% as female. Participant ages ranged from 20 to 68, $M_{age} = 31.58$, $SD = 7.69$. (Table A1, Sample 7).

Study 3D

Three-hundred and seventy Pakistani residents recruited using the Pollfish platform completed the survey, providing informed consent and passing two attention checks. Survey instruments were translated into Urdu by a team of Pakistani psychologists fluent in English and Urdu, and back translated by another bilingual Pakistani academic to check for consistency with original scale item meaning. Sixty-six percent of participants identified as male and 34% as female. Participant ages ranged from 18 to 83, $M_{age} = 29.45$, $SD = 9.31$. (Table A1, Sample 10).

Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - Strongly disagree to 7 - Strongly agree.

Specific Intergroup Relationship Zero-Sum Beliefs

To measure zero-sum beliefs about specific relationships, participants were first provided with a short list of group identities. In the US, this included right-leaning or left-leaning political identities from which they could select the group with which they identified most and the group with which they identified least. Similarly, in Pakistan and India, participants could choose whether they identified most as Pakistani, Indian, Muslim, or Hindu, group identities which represent major conflicts in this region. These identifiers were then inserted into a series of Likert-style items describing the relationship between the selected ingroup and outgroup members in zero-sum terms (examples: “What is good for [liberals] means harm for [conservatives]”, “Anything that helps [Pakistanis] harms [Indians]”). Response options ranged from 1 - Strongly disagree to 7 - Strongly agree ($\alpha = .86$, $\omega = .86$).
Big Five Personality Traits

Personality traits were measured using the Big Five Short Scales (Soto & John, 2017) with three items for each trait rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree*.

Demographic Variables

To control for demographic variables, participants reported age, sex, income, and education.

Studies 3B - 3D Results

To test the hypothesis that a general zero-sum mindset would predict zero-sum beliefs about specific intergroup relationships across a variety of real-world social conflicts, I first examined their zero-order correlations. As predicted, zero-sum mindset was strongly correlated with each of these more specific zero-sum beliefs in the US, India, and Pakistan (Pearson’s $r_s = .48, .40, \text{ and } .63$ respectively, all $ps < .001$). Next, I examined the amount of variance in specific zero-sum beliefs that could be explained by zero-sum mindset alone compared to a model that included other important predictors: education level, income, sex, and all Big Five personality traits.

In United States, the relationship between the general mindset and the specific belief that anything that helps Americans of one political group hurts the other ($\beta = .48$), was little changed when controlling for all demographic and personality variables ($\beta = .46$), and this full model only explained an additional 1% of variance (Adj. $R^2$) compared to zero-sum mindset alone (Table 3.2).

In Pakistan, the relationship between the general mindset and the specific belief that anything that helps Indians hurt Pakistanis and vice versa ($\beta = .40$), was actually slightly strengthened when controlling for all demographic and personality variables ($\beta = .42$). When comparing total variance explained, adjusted for the number of parameters added to the model (Adj. $R^2$), the full model actually performs slightly worse than a simple null model with zero-sum mindset alone (Table 3.3).

In India, the relationship between the general mindset and the specific belief that anything that helps Indians hurt Pakistanis and vice versa ($\beta = .63$), remains robust when controlling for all demographic and personality variables ($\beta = .46$). In India, the full model performs relatively better than in the US or Pakistan, explaining an additional 6% of variance, however, this is still a modest contribution compared to the 40% already explained by the null model with zero-sum mindset alone (Table 3.4).
### Table 3.2

**Regression results using Zero-Sum Beliefs About Relationship Between with Political Groups in the US as Criterion (N = 506 US Residents)**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>( b )</th>
<th>95% CI [LL, UL]</th>
<th>( \beta )</th>
<th>95% CI [LL, UL]</th>
<th>( \text{se}^2 )</th>
<th>95% CI [LL, UL]</th>
<th>( r )</th>
<th>Fit</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero-Sum Mindset</td>
<td>0.49***</td>
<td>[0.41, 0.56]</td>
<td>0.48</td>
<td>[0.40, 0.55]</td>
<td>.23</td>
<td>[0.17, 0.29]</td>
<td>.48***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-Sum Mindset</td>
<td>0.46***</td>
<td>[0.38, 0.55]</td>
<td>0.46</td>
<td>[0.37, 0.54]</td>
<td>.17</td>
<td>[0.11, 0.23]</td>
<td>.51***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agreeableness</td>
<td>0.18**</td>
<td>[0.05, 0.30]</td>
<td>0.12</td>
<td>[0.03, 0.21]</td>
<td>.01</td>
<td>[-0.00, 0.03]</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Openness</td>
<td>-0.20**</td>
<td>[-0.32, -0.08]</td>
<td>-0.14</td>
<td>[-0.22, -0.05]</td>
<td>.02</td>
<td>[-0.00, 0.03]</td>
<td>-.19***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-0.12</td>
<td>[-0.24, 0.00]</td>
<td>-0.09</td>
<td>[-0.19, 0.00]</td>
<td>.01</td>
<td>[-0.01, 0.02]</td>
<td>-.17***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.04</td>
<td>[-0.07, 0.16]</td>
<td>0.04</td>
<td>[-0.06, 0.13]</td>
<td>.00</td>
<td>[-0.00, 0.01]</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Emotion</td>
<td>-0.02</td>
<td>[-0.12, 0.09]</td>
<td>-0.01</td>
<td>[-0.11, 0.09]</td>
<td>.00</td>
<td>[-0.00, 0.00]</td>
<td>.10*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>0.12</td>
<td>[-0.06, 0.32]</td>
<td>0.05</td>
<td>[-0.03, 0.13]</td>
<td>.00</td>
<td>[-0.00, 0.01]</td>
<td>.09*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-0.00</td>
<td>[-0.04, 0.03]</td>
<td>-0.00</td>
<td>[-0.09, 0.08]</td>
<td>.00</td>
<td>[-0.00, 0.00]</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.03</td>
<td>[-0.05, 0.11]</td>
<td>0.03</td>
<td>[-0.05, 0.12]</td>
<td>.00</td>
<td>[-0.00, 0.01]</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. A significant \( b \)-weight indicates the beta-weight and semi-partial correlation are also significant. \( b \) represents unstandardized regression weights, \( \beta \) indicates the standardized regression weights. \( \text{se}^2 \) represents the semi-partial correlation squared. \( r \) represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively. * = \( p < .05 \), ** = \( p < .01 \), *** = \( p < .001 \)

### Table 3.3

**Regression results using Zero-Sum Beliefs About Relationship with Indians as Criterion (N = 368 Pakistani Residents)**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>( b )</th>
<th>95% CI [LL, UL]</th>
<th>( \beta )</th>
<th>95% CI [LL, UL]</th>
<th>( \text{se}^2 )</th>
<th>95% CI [LL, UL]</th>
<th>( r )</th>
<th>Fit</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero-Sum Mindset</td>
<td>0.53***</td>
<td>[0.41, 0.66]</td>
<td>0.40</td>
<td>[0.30, 0.49]</td>
<td>.16</td>
<td>[0.10, 0.23]</td>
<td>.40***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-Sum Mindset</td>
<td>0.56***</td>
<td>[0.42, 0.69]</td>
<td>0.42</td>
<td>[0.32, 0.52]</td>
<td>.15</td>
<td>[0.09, 0.22]</td>
<td>.40***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agreeableness</td>
<td>0.08</td>
<td>[-0.06, 0.22]</td>
<td>0.06</td>
<td>[-0.05, 0.17]</td>
<td>.00</td>
<td>[-0.01, 0.01]</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Openness</td>
<td>-0.07</td>
<td>[-0.22, 0.08]</td>
<td>-0.05</td>
<td>[-0.15, 0.06]</td>
<td>.00</td>
<td>[-0.01, 0.01]</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-0.00</td>
<td>[-0.14, 0.14]</td>
<td>-0.00</td>
<td>[-0.12, 0.12]</td>
<td>.00</td>
<td>[-0.00, 0.00]</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.09</td>
<td>[-0.04, 0.22]</td>
<td>0.07</td>
<td>[-0.03, 0.17]</td>
<td>.00</td>
<td>[-0.01, 0.02]</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Emotion</td>
<td>0.03</td>
<td>[-0.08, 0.14]</td>
<td>0.03</td>
<td>[-0.08, 0.15]</td>
<td>.00</td>
<td>[-0.00, 0.01]</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>0.19</td>
<td>[-0.08, 0.47]</td>
<td>0.07</td>
<td>[-0.03, 0.17]</td>
<td>.00</td>
<td>[-0.01, 0.02]</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (Ruppes)</td>
<td>-0.01</td>
<td>[-0.04, 0.03]</td>
<td>-0.02</td>
<td>[-0.12, 0.07]</td>
<td>.00</td>
<td>[-0.00, 0.00]</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.05</td>
<td>[-0.17, 0.28]</td>
<td>0.02</td>
<td>[-0.08, 0.12]</td>
<td>.00</td>
<td>[-0.00, 0.00]</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. A significant \( b \)-weight indicates the beta-weight and semi-partial correlation are also significant. \( b \) represents unstandardized regression weights, \( \beta \) indicates the standardized regression weights. \( \text{se}^2 \) represents the semi-partial correlation squared. \( r \) represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively. * = \( p < .05 \), ** = \( p < .01 \), *** = \( p < .001 \)
When examining the potential explanatory power of personality variables, I found that the relationship between personality traits and specific zero-sum beliefs differed in striking ways across each sample. In the US, agreeableness and openness negatively predicted specific zero-sum beliefs, but in Pakistan, no personality traits predicted specific zero-sum beliefs. Nor did agreeableness or openness predict specific zero-sum beliefs in India, where instead, conscientiousness predicted lower zero-sum beliefs, and extraversion higher. Yet, also striking is that despite the variability of relationships with personality and demographic variables, across each full model, zero-sum mindset predicted specific zero-sum beliefs with roughly the same strength (US: $\beta = .46$, Pakistan: $\beta = .42$, India: $\beta = .46$).

**Discussion**

In Chapter 3, I found strong evidence that a wide variety of domain-specific zero-sum beliefs, and zero-sum beliefs about a variety of specific social relationships in different cultures could be predicted by individual differences in one’s general belief that different people’s success is usually incompatible, that is, by their zero-sum mindset. Moreover, zero-sum mindset predicted specific zero-sum beliefs across domains and cultural contexts well beyond the effect of their personality traits and demographic characteristics.
As the growing literature on zero-sum thinking continues to demonstrate the ways in which specific zero-sum beliefs stifle social solidarity and foster antagonism in various domains, it will be important to understand the individual differences that might give rise to such beliefs. This research is the first to demonstrate that a zero-sum mindset can predict a wide variety of specific zero-sum beliefs across situations, domains, and even cultural contexts.

If one is inclined towards zero-sum thinking across situations and domains, how might this mindset orient the way people process and interpret information in our environments? Can the core assumption that relationships are zero-sum influence basic cognitive processing styles? In Chapter 4, I examine whether a zero-sum mindset can predict one’s general cognitive style, specifically a stronger tendency towards cognitive processing that is quick, simple, and decisive.
IV

Zero-Sum Mindset & Cognitive Style
Chapter 4

Zero-Sum Mindset & Cognitive Style

One of the assumptions of classical game theory is that every player possesses a perfect understanding of the game they are playing, and the strategic implications of each possible move they and the other player could make. While such a generous assumption allows for the mathematical solutions that game theory seeks to provide, it also severely limits the applicability of such solutions to real-world situations. In any given real-world situation, people are confronted with far more information and complexity than they can process and must make decisions under conditions of “bounded rationality” (Gigerenzer, 2019; Simon, 1990). Therefore, in order to understand how real people make strategic decisions, we must also consider the way people process information in their environments.

How might a generalized belief that life is like a zero-sum game shape the way people process information when making decisions? One of the challenges facing any decision-maker is how much time and effort should be invested in searching and evaluating information before arriving at a conclusion. In general, more time and effort invested lead to greater accuracy, but this comes at the cost of delays in decision-making, also known as the speed vs. accuracy tradeoff (Heitz, 2014). Situations in which slower decision-making is more costly can strongly motivate people to seek quick, unambiguous answers. For example, if you are about to be run over by a car, you will be severely penalized for delays in deciding whether you should jump left or right. Indeed, people who feel threatened tend to demonstrate a stronger need for cognitive closure. The need for cognitive closure is an epistemic motivation characterized by the desire to “seize and freeze,” a drive to arrive at unambiguous conclusions, and a reluctance to question these conclusions once seized upon (Kruglanski & Webster, 2018). According to Webster & Kruglanski (1997), the motivation to seek cognitive closure is “...assumed to be proportionate to the perceived costs or benefits of possessing closure.”

This motivation has been studied as both a state-based motive, where temporary shifts in the environment can increase or decrease the desirability of closure, and more generally, as a “cognitive style,” that is, a more stable motivation to create simple cognitive structures of thinking that make the world more predictable (Roets & Van Hiel, 2007; Webster & Kruglanski, 1994). Perceptions of conflict are associated with higher cognitive rigidity, as the perceived threat increases the motivation for decisiveness in case there is a need for quick defensive or aggressive action (De Zavala et al., 2010; Kruglanski et al., 2012). Such environments can also deplete cognitive resources and increase
preference for simple, rigid, “black and white” thinking that can help one feel safer, and more in control in a threatening environment (Czernatowicz-Kukuczka et al., 2014; Jost et al., 2007). Since a generalized zero-sum view of the world is characterized by a belief in rigid scarcity and pervasive conflicts of interests, such a perception of one’s global environment may lead to a chronic need for cognitive closure.

Another component of the need for closure is the resistance to others’ perspectives. If one sees relationships as zero-sum, then there would be no perceived benefit in the coordination function of perspective-taking, such as when perspective-taking can help one find opportunities for win-win situations in negotiations or in collaborations (Galinsky et al., 2008; Todd & Galinsky, 2016). Similarly, Johnson (2022) finds that more information about others’ perspectives can diminish the tendency to perceive market exchanges as zero-sum. Beyond the simple neglect of others’ perspectives, if one perceives a relationship to be zero-sum, then they might be motivated to avoid taking another’s perspective. If one’s success requires the other to fail, then empathizing with the other party may interfere with pursuing one’s own goals (Zaki, 2014).

In Studies 4A - 4C, I examine whether a zero-sum mindset will predict a stronger generalized motivation for cognitive closure, particularly the avoidance of others’ perspectives, across different cultural contexts. In Study 4D, I experimentally manipulate cognitive motivations to examine whether this relationship can be explained by situational fluctuations in cognitive motives.

Studies 4A - 4C

I tested the hypothesis that a zero-sum mindset would predict a stronger need for cognitive closure in three countries, the United States, India, and Pakistan. In each country, I also examined whether a zero-sum mindset would predict cognitive style beyond the effect of personality and other demographic variables such as education or income.

Study 4A - 4C Method

Participants and Procedure

Study 4A

Five-hundred and six US residents were recruited on Amazon’s Mechanical Turk to participate in Study 2B. Fifty-five percent identified as male, 45% as female. Sixty-nine percent identified as white/Caucasian, 13 % as black/African American, 6 % as Asian, 5% as Latinx/Hispanic, 5% as
mixed ethnicity, and 2 % as other. Ages ranged from 20 to 76. \( M_{age} = 40.05, SD = 11.68 \). (Table A1, Sample 6).

**Study 4B**

Three-hundred and five Indian residents recruited on Amazon’s Mechanical Turk gave informed consent, passed attention checks and two English language comprehension checks, and completed the study. Seventy-seven percent of participants identified as male and 23% as female. Participant ages ranged from 20 to 68, \( M_{age} = 31.58, SD = 7.69 \). (Table A1, Sample 7).

**Study 4C**

Three-hundred and seventy Pakistani residents recruited using the Pollfish platform completed the survey, passing two attention checks. Survey instruments were translated into Urdu by a team of Pakistani psychologists fluent in English and Urdu, and backtranslated by another bilingual Pakistani academic to check for consistency with original scale item meaning. Sixty-six percent of participants identified as male and 34% as female. Participant ages ranged from 18 to 83, \( M_{age} = 29.45, SD = 9.31 \). (Table A1, Sample 10).

**Measures**

**Zero-Sum Mindset**

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree*.

**Need for Cognitive Closure**

Need for cognitive closure was measured using the NFC-15, a 15- item scale with five sub-facets: preference for order, predictability, and decisiveness, the tendency to avoid ambiguity, and closed-mindedness (Roets & van Hiel, 2011). The scale uses Likert-style response items on a scale from 1- *Strongly disagree* to 7- *Strongly agree*, \( M_{\omega} = .89 \).

**Big Five Personality Traits**

Personality traits were measured using the Big Five Short Scales (Soto & John, 2017) with three items for each trait rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree*.
Demographic Variables

To control for demographic variables, participants reported age, sex, income, and education.

Studies 4A - 4C Results

To examine whether seeing life as a zero-sum game predicts a stronger general need for cognitive closure, I first examined zero-order correlations between zero-sum mindset this cognitive style along with its sub-facets in the US, India, and Pakistan. Across all three countries, zero-sum mindset was positively and robustly correlated with zero-sum mindset (Table 4.1). Zero-sum mindset continued to be a robust predictor of need for cognitive closure even when controlling for demographic variables such as education, income, sex, and age, and all Big Five personality traits (US: $\beta = .27$, India: $\beta = .43$, Pakistan: $\beta = .36$, all $p < .001$). Moreover, the relationships between zero-sum mindset and need for cognitive closure also showed a stable pattern of relationship across cultures at the sub-facet level. In each country, the need for order dimension had the weakest relationship with zero-sum mindset, while the closed-mindedness and decisiveness dimensions consistently had the strongest relationships.

Table 4.1
Zero-Order Correlations of Zero-Sum Mindset Need for Closure in the US, India, and Pakistan

<table>
<thead>
<tr>
<th>Variable</th>
<th>USA (N = 506)</th>
<th>95% CI</th>
<th>M</th>
<th>SD</th>
<th>r</th>
<th>95% CI</th>
<th>M</th>
<th>SD</th>
<th>r</th>
<th>95% CI</th>
<th>M</th>
<th>SD</th>
<th>r</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero-Sum Mindset</td>
<td>2.87</td>
<td>1.25</td>
<td>4.29</td>
<td>1.00</td>
<td>.30***</td>
<td>[.22, .38]</td>
<td>4.92</td>
<td>.48***</td>
<td>[.39, .56]</td>
<td>4.99</td>
<td>.43***</td>
<td>[.34, .51]</td>
<td>4.42</td>
<td>.95</td>
</tr>
<tr>
<td>Need for Order</td>
<td>4.60</td>
<td>1.04</td>
<td>4.98</td>
<td>1.12</td>
<td>.36***</td>
<td>[.26, .46]</td>
<td>5.15</td>
<td>1.13</td>
<td>.30***</td>
<td>[.21, .39]</td>
<td>5.15</td>
<td>1.13</td>
<td>.30***</td>
<td>[.21, .39]</td>
</tr>
<tr>
<td>Intolerance for Ambiguity</td>
<td>4.81</td>
<td>1.36</td>
<td>.11**</td>
<td>[.03, .20]</td>
<td>5.20</td>
<td>1.03</td>
<td>.30***</td>
<td>[.19, .40]</td>
<td>5.50</td>
<td>1.03</td>
<td>.26***</td>
<td>[.17, .36]</td>
<td>5.15</td>
<td>1.13</td>
</tr>
<tr>
<td>Need for Predictability</td>
<td>4.83</td>
<td>1.44</td>
<td>4.94</td>
<td>1.14</td>
<td>.35***</td>
<td>[.25, .45]</td>
<td>4.98</td>
<td>1.17</td>
<td>.32***</td>
<td>[.22, .40]</td>
<td>5.15</td>
<td>1.13</td>
<td>.30***</td>
<td>[.21, .39]</td>
</tr>
<tr>
<td>Decisiveness</td>
<td>4.52</td>
<td>1.23</td>
<td>.27***</td>
<td>[.18, .35]</td>
<td>4.99</td>
<td>1.02</td>
<td>.45***</td>
<td>[.35, .53]</td>
<td>5.16</td>
<td>1.06</td>
<td>.37***</td>
<td>[.28, .46]</td>
<td>4.48</td>
<td>1.22</td>
</tr>
<tr>
<td>Closed-mindedness</td>
<td>3.69</td>
<td>1.27</td>
<td>.40***</td>
<td>[.32, .47]</td>
<td>4.48</td>
<td>1.22</td>
<td>.51***</td>
<td>[.42, .58]</td>
<td>4.17</td>
<td>1.21</td>
<td>.32***</td>
<td>[.22, .41]</td>
<td>5.15</td>
<td>1.13</td>
</tr>
</tbody>
</table>

Note: ** = $p < .01$, *** = $p < .001$.

This stability stands in contrast to the variable pattern of relationships observed between need for cognitive closure, demographic variables, and personality traits. The only consistent significant
pattern across contexts for these variables was a positive correlation between need for cognitive closure and trait neuroticism (Pakistan: \( r = .18 \), India \( r = .43 \), US \( r = .28 \), all \( ps < .001 \)). Education was negatively related to need for cognitive closure in India, Pakistan, and the US (Pakistan \( r = -.14 \), \( p = .006 \), India: \( r = -.17 \), \( p = .005 \)) but not significantly so in the US (\( r = -.06 \), \( p = .14 \)). Conscientiousness was negatively related to the need for cognitive closure in the US and India (US \( r = -.13 \), \( p = .005 \), India \( r = -.19 \), \( p = .001 \)) but not in Pakistan (\( r = .02 \), \( p = .679 \)). Other variables were either significantly related to the need for cognitive closure in only one country or significantly related, but in opposite directions. Across these three countries, zero-sum mindset was a far better predictor of cognitive motivational style than personality traits or demographic features.

**Study 4D**

In Studies 4B - 4C, I found that zero-sum mindset predicted a stronger need for closure. However, it is perfectly plausible that the causality flows in the opposite direction. Those who are predisposed to prefer simple, rigid structures of thought may also be more attracted to the simple structure that a zero-sum view of social relationships may offer. Indeed, previous research finds that increasing or decreasing cognitive motivations can alter their implicit game theories. Halevy et al. (2006) found that temporarily increasing cognitive load (i.e., increasing need for closure) can lead people to more readily endorse *any* suggested game theory model as a template for understanding a real-world conflict because such models help meet this need for closure. Similarly, increasing *accuracy* motivations (i.e., lowering need for closure) in a negotiation has been found to reduce people’s “fixed pie” biases (De Dreu et al., 2000). But while the need for cognitive closure and zero-sum mindsets likely exert mutual influence upon one another to some degree, a generalized belief that life is like a zero-sum game should not be as sensitive to situationally specific changes in need for cognitive closure. In other words, I predict a zero-sum mindset is not merely the result of state-based cognitive motivations to find simple models for understanding the world. In this study, I experimentally increased and decreased the need for cognitive closure to test whether temporary changes in cognitive motivations would alter people’s beliefs that life is like a zero-sum game.

**Study 4D Method**

**Participants**

Three-hundred and forty-eight United Kingdom residents recruited on the Prolific platform gave informed consent, passed an attention check, and completed the study. Eighty-three percent of participants identified as white, 5% as South Asian, 5% as East Asian, 4% as black/African, 1% as
Middle Eastern, and 2% as other. Ages ranged from 18 to 76, \( M_{\text{age}} = 39.04, SD = 13.89 \). Forty-nine percent identified as male, 50% as female and 1% as non-binary/other.

**Experimental Procedure**

Participants were randomly assigned to one of three conditions: an *increased* motivation for closure condition, a *decreased* motivation for closure condition, and a *neutral* condition. In the neutral condition, participants simply completed the zero-sum mindset measure followed by an acquiescence index measure and demographic questions that were collected in all conditions. Following Halevy et al. (2006), in the increased motivation for closure condition, participants were presented with a long number at the beginning of the survey and instructed to keep the number in mind until the very end of the survey when they would be prompted to report it again. This task has been found to reliably increase cognitive load and motivate preferences for closure. Next, while holding this number in mind, participants rated the extent to which they see the world as a zero-sum game.

Following De Dreu et al. (2000), in the decreased motivation for closure condition, before responding to the zero-sum mindset measures, participants were prompted to “think carefully about the following questions” because they would be asked to explain and justify their responses later in the survey. This kind of accountability prompt has been found to increase accuracy motivations and people’s willingness to invest more cognitive resources into their deliberations (Kruglanski & Webster, 1996).

**Measures**

**Zero-Sum Mindset**

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree.*

**Acquiescence Index**

Following Soto & John (2017) an index of acquiescent responding can be measured by taking a mean of agreement with items balanced by items with plainly opposing meanings. Just as reverse-key items are meant to reduce acquiescence, taking the average rating of responses and their clear opposites without reverse-scoring produces an estimate of the tendency to merely agree or disagree with a statement without regard to its contents. Ten statements comprised of five pairs of conceptual opposites (e.g., “I hate routines and try to avoid too much structure in my life” and “I find
that establishing a consistent routine enables me to enjoy life more”) were rated on a scale from 1 - Strongly disagree to 7- Strongly agree, and averaged together form a normally distributed estimate of acquiescence. The average negative correlation between paired items was $r = - .42$, all $ps < .001$.

**Study 4D Results**

To examine the efficacy of the “increased need for closure” manipulation, I compared acquiescent response bias, a signal of increased cognitive load (Knowles & Condon, 1999), between the “loaded” and “unloaded” conditions. As expected, participants in the high load condition demonstrated stronger acquiescence compared to the unloaded conditions ($t(346) = 2.32$, $p = .02$).

Next, I examined whether experimentally increasing or decreasing motivation for cognitive closure would influence people’s endorsement of the general belief that life is like a zero-sum game. To test this hypothesis, I conducted a one-way ANOVA comparing zero-sum mindset between conditions. In line with my hypothesis, I found no effect of short-term increases or decreases in cognitive motivation for cognitive closure on zero-sum mindset: $F(2, 345) = .09$, $p = .92$.

**Discussion**

Study 4D demonstrated that situationally specific changes in need for cognitive closure do not increase or decrease the propensity to see life like a zero-sum game. While this study suggests that the relationship between zero-sum mindset and need for closure cannot be explained by changes in state-based need for closure, it does not rule out the possibility that a potentially heritable, stable cognitive processing style or ability might interact with people’s personal experiences and environments in the formation of one’s zero-sum mindset. Indeed, given evidence linking cognitive styles with genetics (Tucker-Drob et al., 2013), it seems likely that such biological cognitive differences could make a simple view of social relationships, such as a zero-sum structure, more readily accepted.

However, other mental models of social relationships, which are also simple but more harmonious, could also satisfy a need for simple, predictable ways of understanding the world (Halevy et al., 2006). So, what inclines someone toward a simple, but harmonious, mental model of social relationships instead of the simple and antagonistic mental model of relationship has yet to be investigated directly. However, ample research across the social sciences has demonstrated that our social environments and social experiences often interact with our inherited dispositions to shape individual differences of all kinds, and zero-sum mindset is likely no exception.
Therefore, a zero-sum mindset may emerge from one’s inherited cognitive style *interacting* with their social environment. But social environments do not just shape people, people also shape their social environments. When one holds a belief that fosters a habitual style of thinking and behaving across situations, they also help to *create* dozens of situations that may re-affirm their way of thinking and behaving. For those with a zero-sum mindset, the generalized belief that different people’s interests are diametrically opposed may also shape basic perceptions of social interactions in a way that *reinforces* a zero-sum view of the world. In Chapter 5, I examine these potential effects of a zero-sum mindset on social cognition.
Zero-Sum Mindset & Social Cognition
Chapter 5

Zero-Sum Mindset & Social Cognition

Since “games” in game theory are defined as strategic interactions between two or more players, games are embedded in social interactions. Therefore, the implicit assumptions dictated by a zero-sum belief will carry implications for cognitive processing in general, but for social cognition in particular. Social cognition describes the encoding, processing, and organization of social information in our environments, that is, how our brains learn to navigate social settings. As a species whose survival has become intertwined with our sociality (Aktipis et al., 2018; Shultz et al., 2011), the judgments we make about how to be successful in our social interactions will determine whether we flourish or flounder.

Social situations are also dynamic. This means that we cannot decide what we should do without also making judgments about what we think others will do. One dominant theory in social cognition, the stereotype content model, proposes that social impressions of others form along two dimensions: warmth and competence (Cuddy et al., 2009). The warmth dimension is an assessment of the other’s basic friendliness. This dimension is presumed to be of chief importance as a prediction of whether the other means to render help or harm—a prediction that would have been essential to survival over the course of human evolution (Fiske, 2018). The competence dimension follows next as a prediction of the other’s ability to act on their intentions. That is, can they help or harm me if they want to? Thus, the implication of the competence judgment, whether the other represents an enemy or an asset, hinges critically upon the warmth judgment.

Importantly, these assessments are also determined by the structure of actual and symbolic resources in our social and economic environment. More specifically, a zero-sum relationship between social agents (e.g., a real competition for scarce resources) leads to lower assessments of warmth (Caprariello et al., 2009). Yet, this low-warmth assessment is likely to follow from the belief that a relationship is zero-sum, regardless of whether this belief corresponds to reality. Therefore, those with a zero-sum mindset, who are inclined to see all relationships as zero-sum, might also be more inclined to perceive others as unfriendly across a broad variety of domains and situations.

Beyond judgments that others may be lacking in friendliness, a zero-sum belief might also bear implications of perceptions of outright hostility. When any loss for one represents gain for another, then there might be reason to suspect any harm that might befall you to be strategic rather than accidental. In support of this idea, social vigilance, anticipation of unethical behavior from one’s
ingroup members, has been found to be higher in cultural settings and situations with higher ingroup competition (Liu et al., 2019). Hostile attribution bias, the tendency to assign hostile intentions to others in ambiguous situations, could serve a protective role in a dangerous environment. The more readily one can identify hostility in another, the more quickly one can mount a defense or a counterattack. When needed, such vigilance may be an important part of one’s survival. However, this perceptual bias may also bring about negative consequences for social interactions. If one incorrectly perceives hostility in others and responds with aggression, this actual hostility may incite a vicious cycle of harm and retaliation. Indeed, decades of research on hostile attribution bias has found that this perceptual bias predicts aggressive behavior in children and adults across cultural contexts (Dodge et al., 2015).

In other words, one critical social implication of a zero-sum situation might be the implicit motivations it assigns to others. To see the world as a zero-sum game is to presume that others are structurally motivated to harm you. Therefore, a zero-sum mindset may shape social cognition and the behaviors that follow from these cognitions by heightening perceptions of hostility in others. In Chapter 5, I investigate whether a zero-sum mindset predicts heightened perception of hostility across a variety of domains and situations. In Study 5A, I experimentally test whether zero-sum competitions promote hostile attributions more than non-zero-sum competitions, and whether those with a zero-sum mindset will respond as if in a zero-sum situation even when it is objectively not so. In Study 5B, I test this hypothesis another way, examining whether the generalized belief that life is a zero-sum game can predict implicit, automatic preference for hostile interpretations of others.

**Study 5A**

To say that a generalized belief that life is like a zero-sum game can increase perceptions of hostility in others rests upon the assumption that a real zero-sum situation should increase perceptions of hostility. Yet, there is surprisingly little direct evidence demonstrating this effect. In support of this idea, the stereotype content model suggests that competitive situations lead people to evaluate others as less warm, and in this research, competitive situations are invariably operationalized as zero-sum competitions (Caprariello et al., 2009). But since competitions can be both zero-sum and non-zero-sum, it is unknown whether there is something particularly potent about the zero-sum structure of a competition that influences social cognition beyond the effect of competitive environments in general. Simply activating a competitive schema, a social setting in which people strive after the same rewards, may be sufficient to alter people’s interpretations of others’ intentions regardless of whether that competition is zero-sum in nature.
In Study 5A, I test the hypothesis that zero-sum competitions elicit more hostile attributions than non-zero-sum competitions. However, I also predicted that those with a zero-sum mindset, who are more inclined to see all situations as zero-sum, would be more likely to perceive hostility in others across both kinds of situations. In other words, I predicted that those without a generalized belief in a zero-sum game would be more responsive to the objective structure of incentives in the situation when interpreting the behavior of others. Meanwhile, those with a generalized belief in a zero-sum game would respond as if in the zero-sum situation, with stronger interpretations of hostility even in the objectively non-zero-sum situation. I also examine whether hostile attributions would in turn predict increased likelihood of retaliation against the perceived aggression.

**Study 5A Method**

**Participants**

Five-hundred and ninety-three US residents recruited on the Prolific platform gave informed consent, passed an attention check, and completed the study. Seventy-four percent of participants identified as white/Caucasian, 9% as Latinx/Hispanic, 8% as East Asian, 8% as black/African American, 6% as South Asian, 1% as Middle Eastern, and 1% as other. Fifty percent of participants identified as female, 49% as male, and 1% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, \( M_{age} = 37.93, SD = 14.28 \) (Table A1, Sample 18).

**Materials and Procedure**

In order to assess hostile attributions, participants were presented with four vignettes describing four different kinds of competitive situations: sports, academics, politics, and the job market. For each category, a competitive situation is described followed by an ambiguous event. Participants were randomly assigned to read about competitions with either a zero-sum structure or a non-zero-sum structure. The competitive contexts (e.g., a race, a job interview) and incentives themselves, that is, what “success” in the competition would entail (e.g., qualifying for the race, getting the job), and the ambiguous situations (e.g., someone tosses a cup that you trip on, someone spills coffee on your shirt) were the same across both conditions. The only thing that varied between the conditions was the *structure* of the rewards. In one condition, the relationship between incentives and other competitors is zero-sum (e.g., only the first few across the finish line will qualify, only one job available), while in the other condition the relationship between competitors and incentives is non-zero-sum (e.g., qualification based on race finish time, or many job positions to be filled by qualified candidates).
After reading each description, participants rated their agreement with a hostile interpretation of the other competitor’s behavior (e.g., “I think they spilled coffee on me on purpose to hurt my chances for the job”) as well as a reverse-scored benign attribution (e.g., “I think it was an accident. They probably didn’t mean to spill coffee on me.”) for a total of eight items rated on a scale from 1-\textit{Strongly disagree} to 7 - \textit{Strongly agree} \((\omega = .81)\).

Next, participants indicated whether they would try to retaliate (“If I had the opportunity, I would try to retaliate in some way”) for a total of four items rated on a scale from 1- \textit{Strongly disagree} to 7 - \textit{Strongly agree} \((\omega = .82)\). After completing measures in the experimental conditions, all participants completed measures of zero-sum mindset using the same scale used in previous studies (Chapter 1) and demographic variables.

\textbf{Study 5A Results}

First, I examined the effect of the zero-sum structuring of competitions on hostile attribution bias. As predicted, participants interpreted the same behaviors by others in competitions for the same rewards as more hostile when those rewards were structured as a zero-sum game \((M = 3.60, \ SD = 1.02)\) compared to when they were structured as a non-zero-sum game \((M = 3.27, \ SD = 1.05; t(590.5) = 3.90, \ p < .001, \ d = .32, \ 95 \% \text{CI}[.16, .48])\). Also as hypothesized, a zero-sum mindset predicted hostile attribution bias across both zero-sum and non-zero-sum situations \((\beta = .38, \ p < .001)\), but the zero-sum mindset was not altered by the effect of the condition \((t(590.99) = .22, \ p = .83)\). Indeed, when I predict hostile attributions from condition and zero-sum mindset, and their interaction, I find a significant main effect of condition \((\beta = .32, \ p < .001)\), zero-sum mindset \((\beta = .47, \ p < .001)\) and the interaction of the two \((\beta = -.18, \ p = .017)\) such that as zero-sum mindset becomes stronger, the effect of the “objective” situation becomes weaker (Figure 5.1).

I also examined the effect of hostile attributions on willingness to retaliate. Consistent with previous literature, stronger attributions of hostility predicted a greater likelihood of retaliating in the future \((\beta = .60, \ p < .001)\). However, the effect of the experimental condition on intention to retaliate was not significant \((t(588.99) = 0.70, \ p = .484)\), suggesting that translating interpretations of hostility into a plan for retaliation was driven largely by individual differences, such as zero-sum mindset which predicted retaliation across conditions \((\beta = .48, \ p < .001)\), rather than the zero-sum situation alone. In other words, interpreting hostility in others may be a necessary, but not sufficient, condition for seeking retaliation.
Figure 5.1

*Effect of the objective situation on hostile bias decreases as zero-sum mindset increases*

Note. All analyses conducted using continuous measures. For visualization purposes, low, moderate, and high zero-sum mindset are represented by lower, middle, and upper quantiles respectively. Error bars represent standard error. Created using Flexplot (Version 0.9.2)

**Study 5A Discussion**

These results suggests that important social cognitions, such as one’s interpretation of hostility in another, can be determined both by external cues in the immediate environment (i.e., an objectively zero-sum situation), as well as an internally informed zero-sum mental model (i.e., zero-sum mindset). In other words, I found that hostile attributions, and by extension, lower perceptions of warmth in others, are uniquely affected by a zero-sum structuring of competitions beyond the effect of the competitive setting itself. Moreover, I find that those with a zero-sum mindset, who are more inclined to interpret any given situation as zero-sum, are also more likely to interpret others’ behaviors as acts of hostility regardless of the situation. Put differently, when
zero-sum mindset is low, the power of the situation and its objective zero-sum or non-zero-sum characteristics are more likely to shape social cognition. However, when zero-sum mindset is high, this stable belief about one’s situation predicts social cognitions consistent with being in a zero-sum game even when it is objectively not so.

These results suggest that someone who is low in zero-sum mindset can recognize when a competition is, in fact, zero-sum, and will update their interpretations of others’ behaviors accordingly. But, when it comes to deciding how to respond strategically to this perceived hostility, those low in zero-sum mindset may also recognize that the zero-sum situation is embedded in a wider, non-zero-sum context in which retaliation might bear other costs. Taking the race vignette as an example, attempts to retaliate against the perceived hostile action of another runner in a race, say by trying to trip them, might help one win the zero-sum competition itself. However, recognizing that success in this particular zero-sum competition is situated within a larger context of what it means to be successful may alter one’s strategic calculus. Whether it is the risk of being disqualified from future races if you are caught, or perhaps more generally, a personal desire to be someone who behaves ethically, those with a low zero-sum mindset may be more adept at integrating their own or others’ broader interests into their situational strategic responses. In contrast, if you see your life or success in general as a zero-sum game, then others’ success will be threatening to your own success even when more broadly considered, potentially making retaliation more appealing.

**Study 5B**

In Study 5A, I also found that the belief that life is like a zero-sum game predicted a stronger tendency to perceive hostility and pursue retaliation across different kinds of situations. Following conventional measures of hostile attribution bias (Crick & Dodge, 1996), participants in Study 5A were presented with vignettes about particular social situations with enough detail to establish the context in which an ambiguous action occurs and make interpretations accordingly. These results demonstrated that certain features of the situation (i.e., zero-sumness) increase hostile attributions as well as individual differences in zero-sum mindset. I found that participants interpreted the same ambiguous behaviors of others as more hostile when situated in a zero-sum situation compared to non-zero-sum situation; And individual differences in zero-sum beliefs about one’s general situation (zero-sum mindset) predicted explicit hostile attributions across zero-sum and non-zero-sum situations.

Since a zero-sum mindset is an implicit belief about how the world works, we might also expect those with stronger zero-sum mindsets to interpret hostility in others implicitly as well. A
stable, generalized belief about the world should pertain to all situations. Therefore, one may begin to interpret others’ actions as if in a zero-sum game almost automatically, that is, as a default assumption about others’ intentions. In Study 5B, I again test the hypothesis that those who see life as a zero-sum game will be more inclined to perceive hostility in ambiguous situations. But in this study (pre-registered), I also test whether the stable, cross-situational nature of a zero-sum mindset might give rise to an automatic, generalized tendency to perceive hostility in others by using an implicit measure of hostile attribution bias. Since people with stronger zero-sum mindsets are also more likely to be cognitively motivated to make quick judgments in general (Chapter 4), I also examined whether there will be a unique effect of zero-sum mindset on hostile attribution bias beyond the effect of this general cognitive style.

Study 5B Method

Participants and Procedure

Eight hundred and twenty-one U.S. residents recruited using Amazon’s Mechanical Turk gave informed consent and passed attention checks to complete the study (70% White, 13% Black/African American, 5% Asian/South Asian, 6% Latin/Hispanic, and 6% Other; 52% female; Ages ranged 18-72, $M_{\text{age}} = 34.54$, $SD = 10.66$). (Table A1, Sample 1).

Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the five items selected and adapted from the BZSG scale. The scale uses Likert-style response items on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree* (Cronbach’s $\omega = .90$).

Implicit Hostile Attribution Bias

Hostile attribution bias was measured using an adaptation of the Word Sentence Association Paradigm - Hostility (WSAP-H) (Dillon, Allan, Cougle, & Fincham, 2016), which measures the strength of associations between ambiguous situations and a hostile attribution compared to benign attributions. In this paradigm, ambiguous situations take the form of short sentences which succinctly describe a wide variety of situations that could be interpreted as either hostile or benign (e.g.,

---

5 The 5-item measure was used in studies conducted before the addition of two reverse-key items to the final 7-item scale.
“Someone bumps into you”). Each sentence appears alone on screen, and after a one second delay, a single word appears below the sentence suggesting an interpretation (e.g., “Accidental”, or “Aggressive”). Participants are instructed to quickly rate the word and sentence as either “related” or “unrelated,” scored as 1 and 0 respectively (Figure 5.3). Thirty sentences were selected from the full WSAP-H paradigm, with each sentence presented once with a hostile attribution word and once with a benign attribution word in a randomized order. To calculate hostile attribution bias, the benign attribution score ($\alpha = .67$) was subtracted from the hostile attribution score ($\alpha = .80$) such that higher scores represent stronger hostile attribution bias.

To further examine the degree of automaticity of hostile attribution bias, response latencies (the duration in seconds between the sentence appearing on screen and first response click) were also measured. Following protocols in implicit association paradigms, participants were invited to try an example of the paradigm before beginning the task, and the first two responses were considered “warm up” items to help familiarize the participant with the task (excluded from average latency estimates). Also following established practice, particularly long response latencies (one standard deviation longer than average response times), which suggests an interruption to the task rather than a meaningful response delay, were not included in response latency averages.

**Figure 5.3**

*Example of ambiguous situation with a benign attribution (left) and hostile attribution (right)*

---

**Need for Cognitive Closure**

Need for cognitive closure was measured using the NFC-15, a 15-item scale with five sub-facets: preference for order, predictability, and decisiveness, the tendency to avoid ambiguity, and closed-mindedness (Roets & van Hiel, 2011). The scale uses Likert-style response items on a scale from 1 (strongly disagree) to 7 (strongly agree), $\omega = .89$.

71
Study 5B Results

First, I examined whether a zero-sum mindset predicts stronger associations with hostile rather than benign interpretations of ambiguous situations. In a linear regression, I found that stronger zero-sum mindsets predicted stronger associations with hostile interpretations compared to benign interpretations across more than a dozen different ambiguous situations ($\beta = .25$, 95% CI [.18 , .32], SE $\beta = .03$, $t = 7.35$, $F(1,819) = 54.07$, adj. $R^2 = .06$, $p < .001$), and this relationship remains significant when controlling for demographic variables, sex, education, age, and income ($\beta = .24$, $p < .001$), as well as when controlling for need for cognitive closure ($\beta = .17$, $p < .001$).

Figure 5.5

Zero-Sum Mindset Predicts More Hostile Attributions Than Benign Attributions

To test the strength of automaticity in hostile attributions for those with a zero-sum mindset, I next examined how quickly participants responded when affirming hostile attributions (rating the situations and hostile attributions as “related”) compared to how quickly they affirmed benign attributions (rating the situations and benign attributions as “related”), as well as how quickly participants rejected hostile attributions compared to rejecting benign attributions (rating the situation
and attribution word as “unrelated”). Shorter latencies correspond to stronger associations while longer latencies correspond to weaker associations (Nosek et al., 2014). So more automatic hostile attribution bias should manifest as relatively quicker hostile affirmations and benign rejections, and relatively slower hostile rejections and benign affirmations.

Using the IAT algorithm for effect size $D$ (Greenwald et al., 2003), which estimates a within-person effect size, I computed an implicit hostile attribution bias score for each participant (difference between hostile and benign affirmation and rejection latencies divided by within-person standard deviation of all response latencies). In a linear regression, zero-sum mindset predicted stronger implicit hostile bias ($\beta = .19, p < .001$) and this effect was little changed when controlling for education, age, sex, and income ($\beta = .20, p < .001$).

To examine this effect more closely, I conducted a repeated measures ANOVA comparing hostile affirmation latencies to benign affirmation latencies, and hostile rejection latencies to benign rejection latencies and their interactions with zero-sum mindset. These models reveal a significant main effect of affirmation type such that, in general, people affirmed benign attributions more quickly than hostile attributions ($F(1,810) = 11.76, p < .001, \eta^2_p = .01$). However, this automatic preference for benign attributions did not emerge for those with strong zero-sum mindsets, as indicated by a significant interaction effect between zero-sum mindset and type of affirmations (hostile vs. benign) ($F(1,810) = 8.46, p = .004, \eta^2_p = .01$).

A similar pattern was found for response latencies for hostile and benign attribution rejections. In general, participants were much slower to reject benign attributions compared to hostile attributions ($F(1,588) = 33.23, p < .001, \eta^2_p = .05$), and once again, this hesitation to reject benign attribution was diminished for those with strong zero-sum mindsets as indicated by the significant interaction between type of rejection and zero-sum mindset ($F(1,588) = 17.41, p < .001, \eta^2_p = .03$).

There was also a significant between-participant effect of zero-sum mindset on latencies in general such that those with stronger zero-sum mindset both affirmed ($F(1,810) = 26.61, p < .001$) and rejected ($F(1,810) = 43.55, p < .001$) both kinds of attributions more quickly than those with lower zero-sum mindset. This finding aligns with the evidence from Chapter 4, which finds that those with zero-sum mindsets have a stronger motivation for cognitive closure – the drive to be decisive and arrive at conclusions quickly. However, even given this general tendency towards shorter response times, those with stronger zero-sum mindsets demonstrate a pattern of relative response rates consistent with more automatic hostile attributions than benign attributions. Moreover, when I control
for the need for closure in a linear regression, the unique effect of zero-sum mindset on implicit hostile bias remains significant ($\beta = .16, p < .001$).

**Discussion**

In Study 5A and 5B, I found that zero-sum structures of rewards increase people’s tendency to assign hostile intentions to others, and that the general belief that life is zero-sum predicts an automatic cross-domain, cross-situational tendency to interpret the ambiguous behavior of others as hostility even in objectively non-zero-sum situations. As demonstrated in Study 5B, such hostile interpretations can bear important consequences for how one might choose to respond to such situations. But even short of these aggressive responses, perceiving hostility in others can have dire consequences in the form of passive responses as well, such as when perceiving hostility in others discourages trust and cooperation, even when such cooperation might lead to better outcomes for all involved.
VI

Zero-Sum Mindset & Trust

Trust is the foundation of society...Where there is society, there is trust, and where there is trust, there is something upon which it is supported.

– Frederick Douglass

I trust no one, not even myself.

– Joseph Stalin
Chapter 6

Zero-Sum Mindset & Trust

It is difficult to overstate the importance of trust for an individual and society’s ability to thrive. Trust is a critical component of interpersonal relationships that are essential to subjective wellbeing (Rempel et al., 1985), in the establishment of wider social cohesion and institutional health (Good, 1988; Portela et al., 2013; Tov & Diener, 2009), and in the economic relationships that foster trade and individual and societal economic growth (Lim, Morshed, & Khun, 2018; Pagden, 1988). Or, as Serritzlew et al. (2014) report, “empirical evidence suggests that social trust is probably the social capital phenomenon with the greatest positive societal consequences.”

Trust can be defined as a judgment about the level of vulnerability one might be willing to endure in order to reap the benefits of trust (Lewicki & Brinsfield, 2011). This broader judgment is informed by three kinds of beliefs:

1. Beliefs about the self (Am I a trusting person?)
2. Beliefs about the other (Are they trustworthy?)
3. Beliefs about the situation (What do I—or they—stand to gain or lose in this situation?).

Different approaches to studying trust have usually focused on one of these kinds of questions. The first sort of belief, beliefs about the self as trusting or untrusting, are largely studied by personality psychologists who use personality measures such as trait agreeableness (trust being one of its three dimensions) to explain trust (Soto & John, 2017). The second set of beliefs place the appraisal of the others’ internal qualities (i.e., their warmth or competence) at the center of what it means to trust (Naef & Schupp, 2011). This set of beliefs is largely studied in terms of social cognition, which describes the cognitive and affective processes that shape social perceptions of trustworthiness as judgments of others along dimensions of warmth and competence (Fiske, 2018). For example, previous research finds that the BZSG (economically-oriented zero-sum beliefs about success) is negatively correlated with “interpersonal trust” -- operationalized as judgments of most other people’s prosocial intentions -- at both the individual-level and country-level (Różyczka-Tran et al., 2015). The third kind of belief that informs trust judgments are beliefs about the situation. However, these beliefs are often overlooked as being “beliefs” at all. Instead, the role of the situation is usually described as an objective fact that influences trust (e.g., the existence of accountability structures or higher payoffs for trusting behavior) rather than as a psychologically mediated experience of a situation. In this sense, a great deal of economics and behavioral economics have demonstrated the way incentives and
assurance can be structured to promote trust and cooperation (Alós-Ferrer & Farolfi, 2019; Fukuyama, 1995; Johnson & Mislin, 2011; Lewicki & Brinsfield, 2011; Serritzlew et al., 2014).

While each of these approaches has made invaluable contributions to our understanding of trust, they have all neglected the ways in which people’s general beliefs about their situation may impact trust beyond the effect of their beliefs about themselves or others, or even beyond the effect of the objective situation itself. More specifically, the implicit beliefs people hold about the nature of resources and success in their environment, that is, whether they see their relationships to others as zero-sum or non-zero-sum, may have a profound impact on trust. For example, if one views their life as a gladiator’s arena, it may matter very little if they think of themselves or the person opposite them as a “nice person” – the zero-sum structure of the situation (whether real or perceived) would subvert trust.

Trust as Attitude and Behavior

Across the many disciplines that study trust, it is most commonly operationalized as attitude, that is, a self-reported appraisal of the basic trustworthiness of others (e.g., “How much would you say most people can be trusted?” from the General Social Surveys 1972:2018), or as a behavior, usually a cooperative behavior that exposes the trustor to some level of risk as in the classic “trust game” (Berg et al., 1995). Operationalizations of trust as an attitude tend to be heavily influenced by one’s expectations of another’s positive intentions or behavior. However, these attitudinal measures of trust do not stipulate the specific criteria that determine trust, but instead capture the respondent’s general perception of the trustworthiness of various targets (e.g., trust in most people, trust in government). Therefore, implicit beliefs about the situation may also inform these global judgments of trust.

Attitudinal measures of trust have been leveraged in multinational surveys such as the Global Social Survey that attempt to monitor broader trends in society (Lewicki & Brinsfield, 2011; Smith, Tom W., Davern, Michael, Freese, Jeremy, and Morgan, General Social Survey, 1972-2018). Such measures can be important indicators for trends in the formation or deterioration of trust in public life where perennial community relationships and relationships with institutions such as our trust in our neighbors or the justice system can shape public behavior. Trust, measured in this way, has been found to predict greater economic development (Pagden, 1988; Schmidt & Uhlig, 2003), organizational success (Mayer et al., 1995), greater wellbeing (Jovanović, 2016; Tokuda et al., 2008), and more recently, better compliance with public health efforts to combat COVID-19 (Devine et al., 2020).
However, in our increasingly complex and global society, we must frequently make decisions about whether or not to trust another with little or no information about them that might inform such an appraisal of their trustworthiness. For example, to buy something online from a new vendor or get into a taxi in a new city, one may have no prior relationship or no prior information about the person or business one must trust in order to make a purchase or get a ride. In these situations, trust decisions must rely more heavily on other features of the trustor and the situation.

Moreover, when trust is operationalized as behavior, there is often an important additional dimension: vulnerability. That is, unlike a trust attitude, trusting behavior requires exposure to risk of real loss or harm. To measure trust as behavior, researchers have largely turned to the classic “trust game” paradigm (Alós-Ferrer & Farolfi, 2019; Berg et al., 1995; Johnson & Mislin, 2011). The typical format of a two-player trust game is as follows:

Two players are designated to be either the trustor or the trustee. The trustor, Player 1, is given an endowment of something of value (often money), and must choose how much, if any, of this endowment to send to Player 2, the trustee. The transfer to Player 2 is then multiplied by a given factor (usually doubled or tripled). Player 2 then has the opportunity to return some of this magnified amount back to Player 1. Critically, however, the trustee (Player 2) is not obligated to return any of this multiplied value back to the trustor (Player 1). Thus, the trustor's initial transfer represents an act of trust by making vulnerable something of value with the expectation that the other player will share the benefits of the original trusting action. In other words, in this paradigm the best performative measure of trust is the degree of vulnerability that can be tolerated because of trust. In the trust game, this takes the form of the “sending” or “giving” money or something else of value to a trustee with an expectation, but not a guarantee, that some portion of the money will be returned.

Even though behavioral measures like the trust game may still utilize the trustor’s general appraisal of the other player's trustworthiness, the amount a player sends is also informed by other features of the person and the situation (Alós-Ferrer & Farolfi, 2019). Indeed, in some instances these other features constitute a different form of trust altogether. This distinction is underscored by dozens of cross-cultural studies that find a weak or even non-existent relationship between general trust attitudes and trust behavior in the trust game (Etang et al., 2011; Glaeser et al., 2000; Lazzarini et al., 2005; Naef & Schupp, 2011). In a multinational study of attitudinal and behavioral trust, Ahmed & Salas (2009) reported that no single survey item measuring attitudinal trust predicted behavioral trust in every country. Therefore, while we have robust evidence that zero-sum mindset predicts lower attitudinal trust, it may bear no relationship to the behavioral form of trust measured in paradigms like the trust game.
Reviewing decades of trust games, Thielmann & Hilbig (2015) summarize the person and situation-specific factors that determine behavioral trust along three dimensions: expectations of others’ fairness, risk analysis, and betrayal aversion. While these determinants are theoretically and empirically distinct, a zero-sum mindset, as a stable individual difference in one’s situational appraisals, may act on each of these determinants of trust in various ways. Let us consider each in turn.

**Expectations of Others’ Fairness**

The expectations determinant of trust behavior in the trust game primarily evaluates whether one expects the other player to behave fairly, that is, for the trustee to reciprocate by sharing the value generated by the trustor. While some trust games may provide certain information about the trustee, these decisions often require one to trust a nameless, faceless player. In such scenarios, one’s expectations of the other player’s fairness amounts to one’s judgment of people’s fairness in general, like a Bayesian prior that helps constrain predictions. In a zero-sum game, success is characterized by exploitation— for one player to win they must make another player lose. Therefore, one who holds the belief that relationships in general are zero-sum may be less inclined to expect fair behavior from an unidentified stranger, resulting in lower trusting behavior.

However, research has also demonstrated that stronger zero-sum beliefs are related to stronger entitlement attitudes (Żemojtel-Piotrowska & Piotrowski, 2012)— an expectation for “special treatment” or belief that one is more deserving than others. Therefore, zero-sum mindset may present a paradox of expectations such that even as those with stronger zero-sum mindsets are less likely to think of others as trustworthy, they may be more inclined to expect a larger share of the pie.

**Risky Prospects**

Aside from evaluations of others, trust behavior is also a risk-taking decision in general. That is, there is a potential for loss or gain with an uncertain outcome. The evaluation of risk in a trust decision may influence trust behavior in several ways. Firstly, individuals may differ in the degree to which they find the uncertainty and ambiguity of the trust situation itself to be aversive. Since those with a zero-sum mindset demonstrate a stable aversion to such ambiguity and unpredictability (Chapter 4), they may avoid trusting behavior simply to avoid this cognitive discomfort. Secondly, evaluating whether a risk is worth taking is also a function of the perceived possible amount to be gained or lost. Research finds that greater possible rewards increase trust behavior by making the risk more worth taking (Johnson & Mislin, 2011). As demonstrated in Chapter 2, to see the world as a zero-sum game is to see resources as relatively fixed. Therefore, beyond any effects of expectations of
others’ behavior or even aversion of uncertainty itself, those with a zero-sum mindset may systematically underestimate the possible gains to be had from trusting behavior, making them less inclined to take the risk.

**Betrayal Aversion**

Research has also identified a unique aversion to losses that follow from the betrayal of another person rather than just losses that follow merely from bad luck (Bohnet & Zeckhauser, 2004). It is proposed that the psychological cost of betrayal goes beyond the monetary loss that may be incurred by misplaced trust. This may be because of what such a betrayal may imply about others, the self, and one’s relationship to others (Aimone & Houser, 2012). For some, to experience betrayal may lead them to question their general beliefs about others’ trustworthiness, which may have negative psychological implications. Experiencing betrayal from another person may also imply a negative sense of one’s own ability to judge others, leading to a negative evaluation of the self. Furthermore, if in a game one player trusts while the other exploits, one may view the relationship between the two players as the relationship between a loser and winner—the one who dominates and the one who is dominated. Someone who views social relationships like a zero-sum game may be particularly inclined to interpret betrayal through the lens of the winner-loser relationship. Therefore, those with a zero-sum mindset may be inclined to resist the vulnerability of trust because of what a potential betrayal would signal about them as a “sucker” and a “loser” – making the psychological cost potentially more poignant than the material cost.

**Overview of the Present Research**

To test the hypothesis that a zero-sum mindset predicts lower trust across domains and situations, I conducted seven studies with 3,738 participants in three countries. In Studies 6A - 6D, I examine whether zero-sum mindset predicts trust across a wide variety of domains even when controlling for other important predictors of trust such as income and education. In Study 6E, I use panel data to examine whether zero-sum mindset can predict changes in trust over time. In Studies 6F - 6G, I test whether a zero-sum mindset can also predict lower behavioral trust. Using the classic “trust game,” I examine whether those with a zero-sum mindset will resist trust and cooperation even when these strategies are objectively incentivized.

**Studies 6A - 6D**

In Studies 6A - 6D, I examined the hypothesis that zero-sum mindset would predict lower trust across a broad variety of domains. To test this hypothesis, I measured trust levels for 10 different
targets that included a variety of interpersonal and institutional relationships: close others (family, friends), people in one’s community (neighbors), local institutions (local government, local businesses), people in general (most people), and larger industries and institutions (media, science, large companies, national government). In Study 6A (N = 350) and 6B (N = 499), I examine the relationship between zero-sum mindset and trust in the United States. In Study 6C (N = 1,523) and Study 6D (N = 1,366) I replicate this analysis in Belgium.

Studies 6A - 6D: Method

Participants and Procedure

Study 6A

Participants who completed an earlier study were invited to participate in this study nine months later. From the original 821 participants who completed this earlier study, 353 participants recruited on Amazon’s Mechanical Turk provided informed consent, and all passed attention checks to complete Study 1A. Among this sample, 72% identified as white, 10% as black, 6% as Latinx/Hispanic, 6% as Asian, 6% as other. Fifty-four percent identified as female, 56% male and < 1% as other/non-binary. Ages ranged from 18 to 72, M_{age} = 36.96, SD = 12.12. (Table A1, Samples 1 and 2)

Study 6B

Five hundred and four US residents recruited using the Prolific platform provided informed consent, passed attention checks, and completed the online study. Sixty-five percent of this sample identified their ethnicity as white, 8% as Latinx/Hispanic, 7% as black/African American, 7% as Asian/South Asian, 2% as Jewish, 1% as Native American, and 9% as other or preferred not to respond. Fifty-six percent of participants identified as female and 44% as male. Participant ages ranged 18-70, M_{age} = 33.39, SD = 11.07. (Table A1, Sample 3)

Study 6C

One thousand five hundred and twenty-three Belgian residents recruited using the online platform Pollfish completed the survey. Among this sample, 73% were Belgian with Belgian heritage, 6% were Belgian with other European heritage, 4% Belgian with North African heritage, 1% Belgian with Sub-Saharan African heritage, 7% Belgian with other heritage, for those who identified as non-Belgians, 5% were European heritage, < 1% African heritage, and 3% other heritage; 40% identified as female, 59% male, and < 1% as non-binary/other. Participants could take the survey in
either French, Flemish or English. Ages ranged 18-74, $M_{age} = 38.52$, $SD = 14.76$. (Table A1, Sample 16)

**Study 6D**

One thousand seven hundred and sixty-six residents of a major Belgian city\(^6\) were recruited to the survey. Participants were recruited using a variety of methods to maximize survey uptake across the city, including mailing an invitation to participate to each physical address in the city, online advertising, flyers, social media promotions and cinema vouchers to incentivize participation. The survey default language was French, but participants could also take the survey in Flemish or English. Sixty-eight percent of participants completed the survey in French, 18% in Flemish, and 14% in English. Among this sample, 1387 participants also passed an “attention check.” Participants who did not pass the attention check but completed the survey still received a cinema voucher, but their data was excluded from analysis. In addition to this, we removed participants who reported having already taken the survey already for any reason which removed a further 11 participants leaving a sample of 1376 participants. Ten participants who reported age under 18 were excluded from the sample for a final sample of 1366 participants. Participants’ ages ranged from 18 to 96, $M_{age} = 44.1$ years old, $SD = 14.2$. Fifty-one percent of participants identified as Belgian with Belgian heritage, 5% as Belgian of other European heritage, 5% as Belgian with North African heritage, 1% as Belgian with Sub-Saharan African heritage, 2% as Belgian with other heritage, for those who identified as non-Belgian, 24% were European, 2% Latin American, 2% Asian, 1% Middle Eastern, 1% Sub-Saharan African, and 5% other. Approximately 54% identified as female, 45% as male and less than 1% as “other” or chose not to respond. Participants could choose not to answer certain questions or leave the survey at any time resulting in missing values for different measures. Varying degrees of freedom in various analyses are due to such missing values. (Table A1, Sample 17)

**Measures**

**Zero-Sum Mindset**

Zero-sum mindset was measured using the 5 items selected and adapted from the BZSG scale (See Chapter 1). The scale uses Likert-style response items on a scale from 1- *Strongly disagree* to 7-*Strongly agree*.

\(^6\) City officials requested that the city not be named
**Trust Attitudes**

In the US samples, participants indicated their degree of trust on a scale from 1 - *No trust at all* to 5 - *A lot of trust*. In Belgium, trust was rated on a scale from 1 - *No trust* to 4 - *Very great trust*. The mean of all trust ratings across targets was used as a broad measure of generalized trust ($\omega_{US} = .85; \omega_{Belg.} = .83$).

**Demographic Variables**

To control for demographic variables, participants reported age, sex, income, and education.

**Studies 6A - 6D: Results**

In all four studies I find that those with a stronger zero-sum mindset demonstrate lower trust across a broad range of trust domains. I also find a consistent pattern such that the largest deficits in trust emerge in the domains where trust is usually the strongest (e.g., friends and neighbors). Conversely, the effect of zero-sum mindset on trust is the weakest in the domains where trust is already very low among the general sample (e.g., national government, large companies). For example, the only instance of a significant positive relationship to trust in these domains was with trust in “large companies” in Study 1C, the category with the lowest trust in general. In other words, where trust is already very low for most people, those with a high zero-sum mindset appear more similar to those with a low zero-sum mindset, but where trust is usually the highest, the deficits become starker.

This general pattern of negative relationships to trust across domains remains robust when controlling for other well-established predictors of trust: education, income, and sex.\(^7\) Table 6.1 displays results for each domain and each study when adjusting for education, income, and sex.

Finally, when examining all trust domains together we find a consistent negative relationship across all studies that remains significant when controlling for other well-established predictors of trust: education, income, and sex (US: $\beta = -.23, p < .001$, Belgium: $\beta = -.24, p < .001$). To further examine the stability of this relationship, in Study 6A, I also examined whether zero-sum mindset predicts trust even when controlling for one the most stable predictors of attitudinal trust, that is, a trusting personality. Indeed, even when controlling for trait agreeableness, zero-sum mindset still

---

\(^7\) In the studies in Belgium, participants could choose not to answer demographic questions, resulting in a lower number of responses with complete data for analyses controlling for education, income, and sex.
robustly predicts trust ($\beta = -0.22$, 95% CI [-.31, -.13], $p < .001$). Moreover, zero-sum mindset measured nine months earlier still predicted lower trust levels nine months later ($\beta = -0.27$, 95% CI [-.37, -.17], $p < .001$) and this remains significant when controlling for trait agreeableness measured at the same time as trust ($\beta = -0.18$, $p < .001$).

Table 6.1

*Partial Spearman correlations conditioned on education, income, and sex*

<table>
<thead>
<tr>
<th>Trust Domain</th>
<th>Study 6D – Belgium (n = 1152)</th>
<th>Study 6C – Belgium (n = 683)</th>
<th>Study 6A – USA (n = 350)</th>
<th>Study 6B – USA (n = 499)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$r$</td>
<td>$p$</td>
<td>$r$</td>
<td>$p$</td>
</tr>
<tr>
<td>Family</td>
<td>-0.128</td>
<td>0.000</td>
<td>-0.197</td>
<td>0.000</td>
</tr>
<tr>
<td>Friends</td>
<td>-0.219</td>
<td>0.000</td>
<td>-0.207</td>
<td>0.000</td>
</tr>
<tr>
<td>Science</td>
<td>-0.176</td>
<td>0.000</td>
<td>-0.107</td>
<td>0.005</td>
</tr>
<tr>
<td>Local Business</td>
<td>-0.145</td>
<td>0.000</td>
<td>-0.102</td>
<td>0.008</td>
</tr>
<tr>
<td>Neighbors</td>
<td>-0.209</td>
<td>0.000</td>
<td>-0.122</td>
<td>0.001</td>
</tr>
<tr>
<td>Most People</td>
<td>-0.219</td>
<td>0.000</td>
<td>-0.108</td>
<td>0.005</td>
</tr>
<tr>
<td>Media</td>
<td>-0.057</td>
<td>0.051</td>
<td>0.050</td>
<td>0.193</td>
</tr>
<tr>
<td>Local Government</td>
<td>-0.128</td>
<td>0.000</td>
<td>0.010</td>
<td>0.794</td>
</tr>
<tr>
<td>National Government</td>
<td>-0.106</td>
<td>0.000</td>
<td>-0.011</td>
<td>0.784</td>
</tr>
<tr>
<td>Large Companies</td>
<td>0.025</td>
<td>0.400</td>
<td>0.086</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Note. In Belgium, participants could choose not to answer demographic questions resulting in smaller $n$ for correlations conditioned on education, income, and sex.
Figure 6.1
Relationship Between All Trust and Zero-sum Mindset in the US and Belgium

Study 6E

In Study 6A, zero-sum mindset was measured at two timepoints, while trust was measured only at the second timepoint. Therefore, we cannot infer any causal direction of influence. In Study 6E, both zero-sum mindset and trust were measured across additional timepoints. With repeated measures of both trust and zero-sum mindset, we can utilize a time varying conditional growth model to compare the effects of within-person changes in zero-sum mindset on trust and vice versa.

Study 6E Method

Participants and Procedure

Participants who completed Study 6B in July 2019 (Timepoint 1) were invited through the Prolific platform to participate in Study 7 in March 2020 (Timepoint 2) during the early onset of the COVID-19 pandemic. Measures were repeated two weeks later in April 2020 (Timepoint 3). The final dataset for analyses comprised 499 participants representing 1,153 observations across 3 measurement occasions. (Table A1, Samples 3, 8 & 9).
Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 5 items selected and adapted from the BZSG scale (See Chapter 1). The scale uses Likert-style response items on a scale from 1- Strongly disagree to 7- Strongly agree.

Trust

Participants repeated the same trust measures used in Studies 6A - 6D, indicating their degree of trust in a variety of targets on a scale from “No trust at all” (1) to “A lot of trust” (5). The mean of all trust ratings across targets was used as a broad measure of generalized trust ($\omega = .82$).

Study 6E Results

To examine whether zero-sum mindset would predict changes in trust over time (or vice versa) two multilevel models were built to compare effect estimates and model fit indices. In Model 1, a longitudinal linear growth curve model for zero-sum mindset with trust operationalized as a time-varying covariate was iteratively specified and estimated. Model 2 follows the same model building procedure but examines the longitudinal linear growth curve for trust with zero-sum mindset as the time-varying covariate. In both models, time is operationalized as the number of weeks from the initial data collection at Timepoint 1. The final models allowed each participant to have their own initial level of and rate of change in zero-sum mindset (Model 1) and trust (Model 2).

Model 1: Multilevel model predicting changes in zero-sum mindset from trust

Visual inspection of within-person changes in zero-sum mindset over time appeared minimal and approximately linear. To evaluate the longitudinal stability of zero-sum mindset, time was included as a predictor of zero-sum mindset with random intercepts and fixed slopes, and random intercepts and random slopes. Time was not a significant predictor of zero-sum mindset in any models ($p = .368$) suggesting that growth rates in zero-sum mindset scores over the three time points did not significantly differ across individuals in the sample. Next, mean-level trust as a predictor of zero-sum mindset was incorporated in the conditional growth model. This model demonstrated, as expected, that trust was negatively related to zero-sum mindset ($p = 0.001$). The final model (Table 2) gauged the possible interaction between time and trust as a predictor of change in zero-sum mindset; it indicated this interaction was not significant ($p = .089$).
Model 2: Multilevel model predicting changes in trust from zero-sum mindset

Following the same model-building procedure produced a growth curve model of trust over time—in this instance, zero-sum mindset was examined as the predictor of trust. In the unconditional growth models, across both fixed slopes and random slopes implementations, the additional covariate of time was not a significant predictor of trust \( (p = .566) \). Indeed, across all of our random slopes models of trust, the variance estimates between individual and average growth rates were consistently close to zero, underscoring the general stability of trust measures. However, the conditional growth model showed that zero-sum mindset significantly predicts a modest mean decrease in trust (-0.04; \( p = 0.017 \)), and the addition of zero-sum mindset as a time-varying covariate resulted in a stronger significant estimate for this effect (-0.07; \( p < .001 \)).

Comparing Models

The growth model predicting changes in trust (Model 2) demonstrated substantially better fit than the model predicting changes in zero-sum mindset (Model 1). The Akaike Information Criteria (AIC) can be used to compare models by examining the absolute difference (\( \Delta \)) in AIC between the two models. According to Burnham & Anderson (2004) a model should be preferred if AIC can be reduced by more than 2 (i.e., \( \Delta > 2 \)), even when this difference is between large numbers:

Naive users often question the importance of a \( \Delta = 10 \) when the two AIC values might be, for example, 280,000 and 280,010. The difference of 10 here might seem trivial. In fact, large AIC values contain large scaling constants, while the \( \Delta \)s are free of such constants. Only these differences in AIC are interpretable as to the strength of evidence. (p. 271)

The Akaike information criteria (AIC) for the final multilevel models of were 2,651 (Model 1) and 1,121 (Model 2), respectively, a \( \Delta \) of 1529.66 between two models with the same parameters. Since intraindividual changes in both zero-sum mindset and trust were minimal, observed effect sizes were also very small. Nevertheless, when comparing models that account for these differences, the evidence unambiguously favors the model in which zero-sum mindset predicts decreases in trust over time rather than the other way around.
### Table 6.2

*Multilevel Growth Curve Models of Trust and Zero-Sum Mindset Over Time*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model 1 Predicting Zero-Sum Mindset From Trust</th>
<th>Model 2 Predicting Trust From Zero-Sum Mindset</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>95% CI</td>
</tr>
<tr>
<td>Time (weeks)</td>
<td>0</td>
<td>[.00, .00]</td>
</tr>
<tr>
<td>Trust</td>
<td>-.25 ***</td>
<td>[-.38, -.12]</td>
</tr>
<tr>
<td>Time * Trust</td>
<td>0</td>
<td>[.00, .01]</td>
</tr>
</tbody>
</table>

### Random Effects

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model Fit</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraindividual residual variance</td>
<td>0.16</td>
<td>0.05</td>
<td>AIC</td>
<td>2650.8</td>
<td>1121.14</td>
</tr>
<tr>
<td>Inter-individual variance</td>
<td>0.19</td>
<td>0.23</td>
<td>Log-likelihood</td>
<td>-1317.4</td>
<td>-552.57</td>
</tr>
<tr>
<td>Random slope variance</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICC</td>
<td>0.83</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Studies 6F - 6G: Trust as Behavior

In Studies 6A - 6E, I found that a zero-sum mindset predicted lower trust across a broad variety of domains and across time. In Studies 6F and 6G, I examine whether zero-sum mindset can also predict lower trust behavior using the trust game paradigm. I also investigate possible motivations and judgments that might animate this effect.

Study 6F

In Study 6F, participants all played the same game with the same structural incentives and assurances. In other words, all participants encountered the same objective situation. Therefore, differences in participants’ behavioral trust should be a function of differences in their own internal motives and perceptions rather than of the situation. I predicted that those with a stronger zero-sum mindset would demonstrate lower trust behavior. I also predicted that they would be more likely to perceive the game as unfair to them despite interacting with an objectively “fair” player, that is, another player who always splits tickets evenly and reciprocates the participants’ own behavior. I also predicted that despite the explicitly positive-sum nature of the trust game, participants with a stronger zero-sum mindset would be more motivated by a zero-sum construal of success. That is, I predicted that they would be more motivated by earning more tickets than the other player rather than simply by earning as many tickets as possible.

Study 6F Method

Trust Game Procedure

In this version of the trust game, participants played to win raffle tickets for a £100 cash bonus prize. Each ticket represented an additional entry into the drawing such that winning more tickets meaningfully increases one’s chances to win £100. In the first round of the game, participants are initially endowed with 100 tickets and can send any amount, from 0 to 100 tickets to Player 2. In keeping with traditional trust game paradigms, the number of tickets sent is then tripled for Player 2. To include the dynamic of strategic cooperation as in iterated trust games, participants are informed that the game will include two rounds such that each player will have the opportunity to play the role of both trustee and trustee.

As I was primarily interested in assessing participants’ basic trust instincts, I assigned all participants to the role of the trustor in Round 1, that is, the player in the game who must make the first decision regarding how many tickets to send to the other player. To facilitate this and to hold
constant the trustworthiness of the other player, we use an automated player for Player 2 such that Player 2 always employed a strategy of perfect fairness (sharing multiplied tickets evenly) and reciprocity (in Round 2, Player 2 always sends however many tickets Player 1 chose to send in Round 1). So, for example, if the participant chooses to send 20 tickets in Round 1, then those tickets are tripled so that Player 2 receives 60 tickets. Player 2 splits these tickets evenly, sending back 30 tickets to Player 1. Then in Round 2, Player 2 mirrors Player 1’s initial behavior, sending 20 tickets to Player 1. In the final part of the game, the participant (as Player 1) then gets to make the final decision about how many tickets to send back to Player 2. They can send any amount of their tickets, including zero tickets, back to Player 2. Since this is the final transfer, and there are no future opportunities for cooperation or defection on behalf of the other player, this decision measures the participants’ trustworthiness, which in this case is also a measure of the participant’s commitment to fairness.

Participants

Five hundred and ninety-nine UK residents completed the study. Of the 599 participants, 534 (89%) identified as white, 30 (5%) as Asian/South Asian, 12 (2%) Black, and 23 (4%) as mixed race or other; Three hundred and thirty-four participants (56%) identified as female; Participants’ ages ranged 18-80 years old, Mage = 37.89, SD = 13.58). Participants were recruited using the Prolific platform. To help correct for the highly liberal skew in the Prolific participant population, recruitment targeted a more balanced representation of liberal and conservative participants using Prolific recruitment settings. The questionnaire was administered online and took about 5 minutes to complete. Participants who failed a simple attention check were asked to return their submission to Prolific and their data was not used for analysis. Participants who completed the survey received a code they could redeem for £0.67 on Prolific. (Table A1, Sample 11)

Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the same 7-item scale described in Chapter 1.

Behavioral Trust

We measured behavioral trust as the number of tickets entrusted to the other player at the outset of the game which ranged from 0 to 100 tickets.
Trustworthiness

In this game design, participants are given the final opportunity to send back tickets, which means they have the chance to exploit the other player’s trust by keeping an unfair number of tickets. Given that Player 2 splits tickets evenly in Round 1, the “trustworthy” response would be for the participant to also send back an even distribution of tickets. Since the absolute number of tickets available at this point in the game is a function of their original trust, we measured trustworthiness as the final ratio of Player 1’s tickets (participant) to Player 2’s tickets, with more equitable ratios (closer to 1 or less than 1) as more trustworthy and more self-serving ratios (more than 1 and higher) as less trustworthy.

Game Motives

Participants rated the degree to which their decisions and strategies in the game were guided by the following motives: “Trying to gain as many tickets as possible”, “Trying to earn more tickets than the other player”, “For fun/curiosity”, “Trying to play ‘nice’.” Each of these possible motives was rated on a scale from 1 - Not at all to 4 - Strongly.

Suspicion of Automated Player

To control for possible suspicion that Player 2’s choices were predetermined, at the end of the study we asked participants to rate the degree to which they suspected that Player 2 was an automated player on a scale from 1 - Definitely not to 5 - Definitely.

Study 6F Results

First, I examined the zero-order correlations of key variables and demographic variables in our analysis (see Table 6.3). As predicted, I find that a zero-sum mindset negatively predicts trust behavior ($r = -.09, p = .03$). In this study, the only demographic variable that also predicted trust behavior was sex, with men demonstrating higher trust than women, which is in keeping with findings from the broader literature (Chaudhuri & Sbai, 2011). Therefore, subsequent analyses also control for sex. Using a multiple linear regression to control for sex, I find that gender appears to suppress the effect of zero-sum mindset on trust such that the relationship between zero-sum mindset and trust becomes slightly stronger ($\beta = .12, p = .005$).

Contrary to expectation, I did not find a significant relationship between zero-sum mindset and the final proportion of tickets sent back to the other player in the final round ($b = -.02, p = .45$). However, many participants mentioned experiencing difficulty calculating the right number of tickets
to send back to Player 2 in order to achieve their desired final ratio. Study 6G addresses this by providing participants with a table of possible outcomes depending on how many tickets they choose to send back.

**Table 6.3**

Zero-Sum Mindset Zero-Order Correlations with Trust and Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Trust</td>
<td>-.09*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Income</td>
<td>.07</td>
<td>-.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Education</td>
<td>-.01</td>
<td>.00</td>
<td>-.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Sex</td>
<td>.15***</td>
<td>.17***</td>
<td>-.10*</td>
<td>-.09</td>
<td></td>
</tr>
<tr>
<td>6. Age</td>
<td>-.07</td>
<td>-.06</td>
<td>.01</td>
<td>-.03</td>
<td>-.06</td>
</tr>
</tbody>
</table>

Note. (0 = Female, 1 = Male); * = p < .05. *** = p < .001.

Examining the players’ motives in the game (Table 6.4), I find that when controlling for sex, those with a zero-sum mindset did not necessarily seem to be any more or less motivated by the desire to maximize tickets in general. That is, they seem to be equally motivated by what it ostensibly means to be successful in this game. However, I also find, as hypothesized, that those with a zero-sum mindset report being significantly more motivated than other players to “beat” the other player, seeing them as a rival rather than as a potential partner in earning tickets.

By using an automated player, the game was designed to be objectively fair by always sharing tickets evenly and always reciprocating in Round 2 the same level of trust extended by the participant themselves in Round 1. However, those with a zero-sum mindset were more likely to see the game itself, and the other player’s behavior as unfair towards them, while making no such judgment of their own behavior (Table 6.5). I also find that those who demonstrated more trust at the beginning of the game were also more likely to see the game and the other player’s behavior, and their own behavior as fair. This illustrates the potentially recursive nature of beliefs in fairness and trust. When one believes others to be generally fair, they may be more likely to extend trust. Both trust and distrust are more likely to be reciprocated, reinforcing one’s beliefs about the fairness or unfairness of others.
### Table 6.4

Zero-Sum Mindset, Trust, and Game Motive Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Trust</td>
<td></td>
<td></td>
<td>-0.12**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Motive: Earn Maximum Tickets</td>
<td>0.06</td>
<td>-0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Motive: Earn More Tickets Than Other Player</td>
<td>0.17***</td>
<td>-0.33***</td>
<td>0.47***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Motive: Have Fun</td>
<td>-0.10*</td>
<td>0.07</td>
<td>-0.01</td>
<td>0.048</td>
<td></td>
</tr>
<tr>
<td>6. Motive: Play Nice</td>
<td>-0.11**</td>
<td>0.30***</td>
<td>-0.36***</td>
<td>-0.44***</td>
<td>0.14***</td>
</tr>
</tbody>
</table>

*Note.* Conditioned on sex. * = $p < .05$. ** = $p < .01$. *** = $p < .001$.

### Table 6.5

Zero-Sum Mindset, Trust, and Perceived Fairness Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Trust</td>
<td></td>
<td></td>
<td>-0.12**</td>
<td></td>
</tr>
<tr>
<td>3. Fairness: Game</td>
<td>-0.11**</td>
<td>0.13**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Fairness: Other Player</td>
<td>-0.15***</td>
<td>0.12**</td>
<td>0.43***</td>
<td></td>
</tr>
<tr>
<td>5. Fairness: Self</td>
<td>0.02</td>
<td>0.10*</td>
<td>0.20***</td>
<td>0.34***</td>
</tr>
</tbody>
</table>

*Note.* Conditioned on sex. * = $p < .05$. ** = $p < .01$. *** = $p < .001$. 

93
**Suspicion of an Automated Player**

After playing the game, 88% of participants reported some degree of uncertainty as to whether or not they were playing the game with another participant in real time or with an automated player. This uncertainty appears to have prevented participants from operating under the assumption that they were interacting with another participant in real time. Most importantly, I observed no relationship between participants’ suspicion that the other player might be automated and trust behavior in the game ($p = .96$).

**Study 6G**

In Study 6F, I found that zero-sum mindset predicted lower trust behavior, stronger motivations to earn more tickets than the other player, and a tendency to perceive the game and the other player as being unfair despite objective fairness. In Study 6G, I sought to replicate the relationship between zero-sum mindset and trusting behavior, and to test an additional possible mechanism: that those with a zero-sum mindset might systematically underestimate the potential benefits of cooperation, and that this underestimation may predict less trusting behavior.

I investigated this hypothesis in two ways, firstly, by simply measuring participants’ estimates of potential growth and examining whether those with a zero-sum mindset were more likely to underestimate potential gain. Secondly, by randomly assigning participants to one of three conditions. In the first condition, participants estimated possible growth before beginning the game (Pre-Game Estimate Condition). In the second condition, participants were asked to estimate possible growth after the game (Post-Game Estimate Condition), and in a third condition, participants were told explicitly the maximum number of tickets that could be generated before playing the game if one applied a strategy of perfect coordination and trust (Pre-Game Information Condition). In this way, we can compare separately the effects of estimations of potential growth and the knowledge of potential growth on trust as well as whether playing the game alters these estimations.

Firstly, in this study I aimed to replicate the effect of zero-sum mindset on trust observed in Study 6F in the estimation conditions. Secondly, since responding to zero-sum mindset measures immediately before the game could activate the salience of zero-sum relationships before game play, I also examine whether zero-sum mindset measured five days before the participant was invited to play the game could also predict their evaluations and decisions within the game. More specifically, I expected that zero-sum mindset would predict lower estimations of possible gains through cooperation and that this lower estimation would, in turn, predict lower trust behavior. Finally, I also expected to replicate the earlier finding that zero-sum mindset will predict stronger motivation to earn
more tickets than the other player, in addition to also predicting a stronger motivation to “avoid betrayal.”

By comparing pre-game and post-game estimates of potential gains, I also explore whether the experience of playing the game alters one’s estimations of the potential growth, and whether this differs for those with a zero-sum mindset. Further examining the role of systematic underestimation of possible gains, I also examine whether the effect of zero-sum mindset on trust behavior will be attenuated when, instead of estimating gains, participants are simply given explicit information about possible gains. Lastly, I also examined whether providing a clearer guide of the distribution of final ticket outcomes would reveal differences in “trustworthiness” for those with a zero-sum mindset.

**Study 6G Method**

**Participants**

Four hundred and nineteen U.S. residents completed the study, of which 323 (77%) identified as white, 37 (9%) Asian/South Asian, 25 (6%) as Latinx/Hispanic, 21 (5%) as black/African American, 4 (1%) as Native American, and 9 (2%) as other or preferred not to respond; 58% female; Ages ranged 18-77, Mage = 36.67, SD = 12.75). Participants were recruited using the Prolific platform in two stages. First, a large representative sample of US residents was collected which measured baseline zero-sum mindset and demographic variables (N = 2952, Table A1, Sample 13). Five days later participants from this sample were invited to participate in this study. (Table A1, Sample 14)

**Procedure**

After providing informed consent, participants read a description of the game procedure which was also available for reference throughout the game. After reading about how the game works, participants were randomly assigned to either a pre-game estimation condition, a post-game estimation condition, or an informational intervention condition. In the pre-game estimation condition, participants were asked to estimate the total number of tickets that could possibly be generated in the game before beginning Round 1. In the information intervention condition, participants are presented with explicit information about the maximum number of tickets that could be generated in the game through perfect coordination. Participants in this condition are also asked to indicate how many tickets can be generated in the game, framed as a comprehension check of the information just provided. In the post-game estimation participants make this same estimation immediately after the game has finished. All participants played the same trust game with the same algorithm that ensured that each
player received an even split of tickets generated, as well as reciprocation of the same behavior demonstrated by the participant in Round 1. The game was followed by additional questions about their motives and perceptions when playing the game. Lastly, participants were debriefed and reminded of the specific date of the raffle drawing for their chance to win £100. Every player who completed the study was entered into the raffle at least once. For every ticket won in the game, a participant’s anonymous ID was added to the pool from which a winner was randomly selected and paid a £100 cash bonus through the Prolific platform.

Measures

Zero-Sum Mindset

Zero-Sum Mindset was measured using the 7-item scale described in Chapter 1 ($\omega = .89$).

Trust

Just as in Study 3, behavioral trust was measured as the number of tickets entrusted to the other player at the outset of the game which ranged from 0 to 100 tickets.

Trustworthiness

Also, as in Study 3, participants are given the final opportunity to send back tickets, which means they have the chance to take advantage of the other player by keeping all of the tickets sent by Player 2 in the second round of the game or to share some portion of the tickets entrusted. Given the feedback I received that many participants struggled to calculate how many tickets to send in order to achieve a certain final distribution, I provided participants with a guide, generated from their current ticket totals, which showed them the number of tickets they would need to send in order to achieve various distribution outcomes on a spectrum from giving all tickets to the other player, to keeping all tickets for oneself. However, this was only a guide to allow participants to more easily allocate the number of tickets that corresponded to the final ratio they desired. Participants were reminded they could send any amount they chose. Trustworthiness is measured as the final ratio of Player 1’s tickets (participant) to Player 2’s tickets, with more equitable or generous ratios (closer to 1 or less than 1) as more trustworthy and more self-serving ratios (higher than 1) as less trustworthy.

Estimated potential growth and loss

Participants were asked to provide a “quick, rough estimate for how many tickets total you think could possibly be generated by both players” through playing the game as well as “how many
tickets you could possibly lose.” Response options ranged from 0 to 1000 in even 100 ticket increments (0, 100, 200, 300...1000).

**Game Motives**

Participants rated the degree to which their decisions and strategies in the game were guided by the following motives: “Trying to gain as many tickets as possible”, “Trying to earn more tickets than the other player”, “For fun/curiosity,” “Trying to play ‘nice’,” “Trying to avoid being exploited (taken advantage of) by the other player.” Each of these possible motives was rated on a scale from 1-Not at all to 4 - Strongly.

**Fairness**

Participants rated their perceptions of the fairness of the game itself (“How fair would you say the game was for you?”), the fairness of the other player (“ How fair would you say the behavior of the other player was in this game?”) and the fairness of their own behaviors (“How fair would you say your behavior was in this game?”) rated on scale from 1 - Very Unfair to 7 - More than Fair.

**Study 6G Results**

First, I use linear regression to replicate the main findings from Study 3. As predicted, I found that zero-sum mindset measured five days before the game predicted lower trust behavior in the estimation conditions ($N = 276, \beta = -.14, 95\% \text{ CI} [-.02, -.26], p = .02$, and when controlling for sex $\beta = -.17, 95\% \text{ CI}[-.05, -.28], p = .006$). Interestingly, the effect was actually slightly weaker when examining zero-sum mindset measured immediately after game play in the estimation conditions ($\beta = -.11, p = .07$, controlling for sex $\beta = -.13, p = .02$) suggesting that the zero-sum mindset predicts lower trust behavior better that lower trust behavior predicts zero-sum mindset. Also as predicted, zero-sum mindset predicted lower estimations of possible growth ($\beta = -.15, 95\% \text{ CI} [-.04, -.27], p = .01$, controlling for sex $\beta = -.14, 95\% \text{ CI}[-.02, -.26], p = .02$). When we examine the effect controlling for condition (including the explicit information condition, $N = 415$) we find the same effect, such that for every unit increase in zero-sum mindset (on a scale from 1-7), participants estimate approximately 35 fewer tickets that they think could be generated by the game ($p <.001$). And indeed, greater estimations of possible growth also predict greater trust behavior ($\beta = .22, p <.001$). Results displayed in Table 6.6. In contrast, zero-sum mindset did not predict higher estimations of possible loss ($b = -19.19, p = .10$), and the negative trend of this relationship suggests that those with a zero-sum mindset do not appear particularly prone to anticipate losses through game play even though they
underestimate possible gains. In fact, perceptions of possible loss in this game did not predict trusting behavior in general ($p = .67$).

**Table 6.6**

**Zero-Sum Mindset, Trust Behavior and Estimated Gains Correlations ($N = 276$)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset (T1)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Zero-Sum Mindset (T2)</td>
<td>0.70***</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Trust</td>
<td>- 0.16**</td>
<td>- 0.13*</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>4. Estimated Potential Gain</td>
<td>- 0.14*</td>
<td>- 0.07</td>
<td>0.28***</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note.* Estimation conditions only. Conditioned on sex. * $p < .05$, ** $p < .01$, *** $p < .001$

Trust also differed significantly by condition (in a one-way ANOVA: $F(2, 416) = 9.45, p < .001$) such that those who were asked to either estimate gains in advance or were provided explicit information about possible gains before playing demonstrated more trusting behavior than those who estimated possible gains only after playing the game (Cohen’s $d = .44$). Interestingly, participants’ estimations of potential gains did not differ significantly between the pre-game or post-game estimation conditions, and trust behavior did not differ significantly between the pre-game estimation condition and the pre-game explicit information condition. In other words, for most participants playing the game does not appear to significantly alter estimations of potential gains. However, bringing attention to possible gains (either by estimation or direct information) before decision-making does appear to increase trust behavior in general. Yet the salience of potential growth appeared to be less effective for those with the highest zero-sum mindsets (Figure 6.2).
Figure 6.2
Effect of Possible Gain Salience on Trust for those with High, Moderate, and Low Zero-Sum Mindset


Unexpectedly, I also observed the effect of zero-sum mindset on perception of possible gains even in the *explicit information* condition. While the direct information appears to raise the mean estimation for all participants, this estimation still declines as zero-sum mindset increases, illustrating the way objective information might alter one’s “anchoring heuristic” even as the tendency to downgrade the potential for growth persists for those who see the world as a zero-sum game. This suggests at least two distinct ways in which perception of possible growth can influence trust behavior: through mere salience, as in the conditions of calling attention to potential gains before the game even when the amounts estimated did not significantly differ (Figure 6.2), and through systematic perceptual bias that underestimates the potential of growth even when it is made salient, as for those high in zero-sum mindset across all conditions (Figure 6.3).
Examining whether zero-sum mindset predicts trustworthiness, I found that those with stronger zero-sum mindsets (measured after the game) were more likely to exploit this final transfer to their advantage ($\beta = .13, p = .008$), giving themselves a higher ratio of tickets despite the other player having shared tickets evenly in the first round. However, zero-sum mindset measured five days prior did not predict trustworthiness in the game ($p = .79$). Although zero-sum mindset was generally stable across the two timepoints ($r = .70$, ICC = .82) and changes in zero-sum mindset immediately after game play were small ($M_{ZSM(T1)} = 2.8$, $M_{ZSM(T2)} = 2.99$, $t(418) = 2.53$, $d = .12$), the direction of change was rather surprising. One might expect that the experience of playing an objectively positive-sum game designed to demonstrate perfect fairness and reciprocity should have the effect of reducing zero-sum beliefs about life, but for some participants, I found exactly the opposite.

Exploratory analysis revealed that while participants’ own trust behavior did not predict changes in zero-sum mindset ($\beta = -.05, p = .35$), participants who demonstrated lower trustworthiness
themselves, that is by giving themselves a larger share of the tickets in the final decision were also more likely to show increases in their zero-sum mindset ($\beta = .19, p < .001$). Interestingly, this did not mitigate their own assessments that the other player behaved unfairly. Despite the objective fairness of the other player in this game, such a perception could also have been leveraged to justify unfairness. Although unlike in Study 6F, those with a zero-sum mindset also described their own behavior as unfair, albeit to a lesser degree than they perceived the other player’s behavior to be unfair (Table 6.7).

Table 6.7
Zero-Sum Mindset Correlations with Perceptions of Fairness

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset (T1)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Zero-Sum Mindset (T2)</td>
<td>—</td>
<td>0.69***</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>3. Fairness: Game</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4. Fairness: Other Player</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5. Fairness: Self</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note. Conditioned on variables: sex; * $p < .05$, ** $p < .01$, *** $p < .001$

Examining the players’ motives in the game, I find that zero-sum mindset measure five days before the game and immediately after the game both predict stronger motivation to earn more tickets than the other player ($\beta = .26, p < .001, \beta = .39, p < .001$). Interestingly, zero-sum mindset measured before the game does not significantly predict motivation to earn as many tickets as possible ($\beta = .05, p = .29$) but zero-sum mindset after the game does ($\beta = .20, p = .001$), suggesting that perhaps the drive to dominate the other player in the game vicariously increased the motive to earn as many tickets as possible. Zero-sum mindset also predicts aversion to betrayal when measured both five days before ($\beta = .14, p = .005$) and after the game ($\beta = .23, p < .001$). (Table 6.8)
Table 6.8

Zero-Sum Mindset and Game Motive Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset (T1)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Zero-Sum Mindset (T2)</td>
<td>0.69***</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Motive: Earn Maximum Tickets</td>
<td>0.052</td>
<td>0.20***</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Earn More Than Other Player</td>
<td>0.26***</td>
<td>0.39***</td>
<td>0.49***</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Motive: Fun</td>
<td>0.09</td>
<td>0.06</td>
<td>0.06</td>
<td>0.14**</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>6. Motive: Play Nice</td>
<td>0.07</td>
<td>-0.06</td>
<td>-0.21***</td>
<td>-0.13**</td>
<td>0.19***</td>
<td>—</td>
</tr>
<tr>
<td>7. Motive: Avoid Betrayal</td>
<td>0.14**</td>
<td>0.23***</td>
<td>0.19***</td>
<td>0.42***</td>
<td>0.07</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

Finally, I examined whether correcting the systematic underestimation of possible gains would help mitigate trust deficits for those with stronger zero-sum mindsets by predicting trust from zero-sum mindset (measured five days earlier) and condition (information vs. estimates) and their interaction. While the explicit information about possible gains does appear to increase trust behavior above the other estimation conditions (information condition $\beta = .32, p = .002$), this effect appears to be generalized to the entire sample of participants and does not provide a significantly unique increase for those with a zero-sum mindset (interaction $\beta = .12, p = .23$) who still demonstrated lower trust ($\beta = -.13, p = .025$). This may be at least in part because, as I observed earlier, those with a zero-sum mindset continued to systematically underestimate potential growth even in the explicit information condition.

Discussion

Across seven studies with more than 3,738 unique participants including multinational surveys, longitudinal designs, and behavioral experiments, I find compelling evidence that a zero-sum mindset undermines trust across a wide variety of domains and situations.
Studies 6A - 6D demonstrated the breadth of the effect of zero-sum mindset on trust, such that over and above measure of personality, or demographic variables such as education, income or sex, zero-sum mindset predicted lower trust across a wide variety of unrelated domains such as trust in one’s family and friends as well as lower trust in science or local businesses. Moreover, I found strikingly similar patterns of low trust across four different samples measured in two different countries over the course of three years.

Study 6E demonstrated the direction of the effect of zero-sum mindset on trust. In a longitudinal study with repeated measures of zero-sum mindset and trust from both before and after the COVID-19 pandemic, I found that a model using changes in zero-sum mindset to predict changes in trust evidenced a considerably better fit compared to a model using changes in trust to predict changes in zero-sum mindset. In other words, this evidence clearly favored the interpretation that zero-sum mindset reduces trust rather than the other way around. While the remarkable stability of zero-sum mindset across time and situations is part of what makes it such a powerful predictor of trust, it also makes it more difficult to manipulate experimentally. Thus far, early pilots attempting to reduce zero-sum mindset by using brief reflection exercises in online experiments have had only meager results. Future research may wish to investigate whether and how zero-sum mindset might be altered in a meaningful way so we may strengthen our causal inferences.

Studies 6F and 6G demonstrated the depth of the effect of zero-sum mindset on trust. While even general trust attitudes have not been found to reliably predict trust behavior in the trust game across cultural contexts, I found that a zero-sum mindset predicted lower trusting attitudes and lower trust behavior in three countries. Moreover, zero-sum mindset predicted lower trust behavior both when measured immediately before playing the game, but also when measured five days prior, suggesting the stability of mindset’s ability to predict behavior across situations.

Using the trust game paradigm with these repeated measures of zero-sum mindset also allowed examination of several potential mechanisms underpinning this effect. As a generalized belief that success is zero-sum, both the perceptions and motivations promoted by a zero-sum mindset can diminish trust. Those with stronger zero-sum mindsets were more likely to misperceive the objective potential benefits of trust, underestimating the total growth possible in the game even when this potential was made explicit. They were also more likely to see the game itself and the other player’s behaviors in the game as unfair to them, even though the other player’s moves were predetermined to be perfectly fair (and the game itself was, if anything, tilted slightly to their advantage by giving them both the first move and the last move in the game). These misperceptions of the objective situation, perceptions that skewed towards a zero-sum reality of fixed scarcity and unfairness, also predicted
lower trust behavior in the game. A zero-sum view of success also predicts the specific kinds of motives that one prioritizes in the trust game situation. For those with a zero-sum mindset the motive to earn more than the other player trumps the motive to earn as much as possible. But since success in a zero-sum game is relative, those with stronger zero-sum mindsets were less inclined to trust the other player as this may benefit their perceived rival and expose them to exploitation.

Moreover, those that exploited the other player in their final move were also more likely to show small, but significant increases in zero-sum mindset following the game. This suggests that participants facing the final choice regarding ticket sharing, a zero-sum decision embedded in a broader non-zero-sum game, who exploited this power may have justified their behavior to themselves by more strongly embracing the notion that this is just how the world works. In other words, it may be that being exploited does not necessarily promote a zero-sum mindset,\(^8\) but rather, doing the exploiting. Future research should examine this more directly.

These findings also illustrate the potentially recursive nature of the effect of zero-sum mindset on trust whereby those who see success as zero-sum treat others as rivals instead of collaborators, missing opportunities for growth and exploiting others in a way that perpetuates their vision of the world as a place defined by fixed scarcity and unfairness.

Our capacity to address some of our most grave collective challenges, such as battling diseases with vaccines or rebuilding faith in the legitimacy of our elections, hinge upon our capacity for trust. While most trust-building efforts focus on people’s beliefs about trustworthiness as an internal attribute of person or institution, this evidence suggest that we should also attune to people’s beliefs about the structure of incentives in the environment, that is, the implicit game theories people hold that may be shaping their perceptions and motivations for trust.

Given the importance of trust for human flourishing at every level of society, understanding what promotes or diminishes trust across domains and situations will be essential to our individual and collective success. This research highlights a potentially important and understudied determinant of trust: the implicit belief that our success is like a zero-sum game.

\(^8\) Though it may. Since the game was designed to treat all participants fairly, we cannot observe the effect of being exploited on zero-sum mindset in this study.
VII

Zero-Sum Mindset & Cooperation
Chapter 7

Zero-Sum Mindset & Cooperation

In any game, understanding what kind of game you are playing is an essential part of figuring out which strategies are needed to be successful. In the same way, to figure out how to be successful in life, one must first, perhaps implicitly, decide what kind of game life is like. Is life a game defined by cut-throat competition, “survival of the fittest”? Or by mutual interdependence and cooperation? These questions about the nature of life on this planet have featured in debates among scientists and philosophers for centuries, if not longer.

What is not debated, however, is that cooperation, both in nature or society, can create benefits and advantages for those who collaborate that would not otherwise be possible. Whether or not a game will require cooperation to be successful depends largely on the degree to which the interests of different players are in harmony or in conflict (Zizzo & Tan, 2011).

Among the many types of game theoretical models of players’ interests, the zero-sum game is least harmonious. In fact, it is referred to as a “pure conflict” game because it offers no incentives for cooperation whatsoever (Schelling, 1958). Therefore, to see life as a zero-sum game is to see the world as a place where cooperation is unlikely to be an effective strategy for success. Moreover, a zero-sum mindset may disincentivize cooperation even in situations where it is needed most.

In Chapter 7, I examine the hypothesis that a zero-sum mindset will predict resistance to cooperation. In Study 7A, I test whether this mindset will predict lower perceived value for cooperation in general beyond the effect of personality traits such as agreeableness and other demographic variables. In Studies 7B-7D, I examine whether a zero-sum mindset predicts lower cooperation in a real-world situation where cooperation is essential to individual and collective success: a global pandemic.

Study 7A

In Study 7A, I examine whether one’s general belief that life is like a zero-sum game will predict one’s general strategic preference for cooperation, and in particular, as a strategic response to scarcity. As evidenced in Chapter 2, those with a zero-sum mindset are inclined to see life through the lens of scarcity. But perhaps more importantly, for those with a zero-sum mindset, this scarcity is characterized by the immutable finitude of rewards and resources.
When scarcity is amenable to growth, people may be more likely to respond with cooperation rather than competition. If scarcity is temporary, people can use coordinated efforts to distribute resources in a way that meets everyone’s needs until the situation changes. Just as a ship crew on a long voyage may respond to the scarcity of food onboard by rationing meals because they know that this scarcity will only last until they arrive at the next port. Similarly, the belief that scarce resources can be increased might also promote cooperation through larger-scale efforts to “grow the pie” and create more resources for everyone. For example, the well-known “rice theory” of cultural differences in cooperation suggests that in rice-based agricultural societies, the need to coordinate irrigation and planting efforts led to widespread cooperation as a response to food scarcity (Talhelm et al., 2014). Of course, this strategic calculus might change dramatically if growth or renewal was impossible. If scarcity is fixed, then success or survival may depend more upon competing for dominance and control of resources rather than cooperation towards expanding them.

But cooperation may be motivated by more than just strategic reasoning. People may also prefer to cooperate for moral reasons, because it is socially desirable to do so, or because they view themselves as the kind of person who cooperates. For example, those who are high in trait agreeableness have been found to cooperate even under conditions of resource scarcity (Koole et al., 2001). Therefore, in Study 7A, I test the hypothesis that zero-sum mindset will predict a lower strategic preference for cooperation under scarcity, even when controlling for trait agreeableness.

**Study 7A Method**

**Participants and Procedure**

Four hundred and ninety-nine US residents recruited on the Prolific platform provided informed consent and completed the survey which required passing all attention checks. Sixty-six percent of participants identified as white/Caucasian, 7% as Latinx/Hispanic, 7% as East Asian, 7% as black/African American, 2% as South Asian, 1% as Middle Eastern, and 5% as mixed race, and 5% as other. Fifty-four percent of participants identified as female, 42% as male, and 4% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, $M_{age} = 33.67, SD = 12.33$. (Table A1, Sample 4).

---

9 Interestingly, this non-zero-sum attitude suggested by farming practices does not appear to extend to construal of other social resources as more recent research suggests that the fixed nature of social relationships in more collectivist societies may promote zero-sum thinking in other ways (Liu et al., 2019).
Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree*.

Strategic Preference for Cooperation

The strategic preference for cooperation during times of scarcity was measured using two Likert-style items: “When resources are scarce, it becomes more important to cooperate rather than compete” and “When resources are scarce, it becomes more important to compete rather than cooperate” (reverse-scored). Statements were rated on a scale from 1 - *Strongly disagree* to 6 - *Strongly agree* ($r = .74$).

Control Variables

Big Five Personality Traits

Personality was measured using the Big Five Short Scales (Soto & John, 2017) with the same items used in Study 2.

Demographic Variables

To control for demographic variables, participants reported age, sex, income, and education.

Primal World Beliefs

Primal World Beliefs were measured with the same items used in Study 2.

Study 7A Results

To test whether zero-sum mindset will predict general strategic preferences, I examined the relationship between zero-sum mindset and support for cooperation under scarcity. As predicted, I found that a zero-sum mindset robustly predicted lower support for cooperation ($\beta = -.29, p < .001$). Moreover, zero-sum mindset predicted lower support for cooperation even when controlling for demographic variables (sex, age, income, education), all the Big Five personality traits, and primal world beliefs (scarce, competitive, changing, unjust, dangerous, unimprovable, hierarchal, atomistic) and ($\beta = -.24, p < .001$).
Studies 7B - 7D

In Study 7A, I found evidence for a robust unique relationship between zero-sum mindset and a general resistance to cooperation. However, objective situations vary in the degree to which cooperation is needed for success. Therefore, in Studies 7B - 7D, I investigate whether a zero-sum mindset will predict aversion to cooperation even in a situation where cooperation could be a matter of life or death: COVID-19.

A global pandemic, perhaps more than any other form of public crisis, requires widespread cooperation and sacrifice from citizens and nations in order to be successful (Devine, Gaskell, Jennings, & Stoker, 2020). When a deadly virus with no established treatment options is spreading rapidly through human contact, the safety of the collective hinges upon the cooperative behaviors of individuals. And yet, the need for collective cooperation during a pandemic must contend with potentially conflicting motivations to compete for scarce resources or to behave according to individual interests rather than collective interests even when it endangers others.

In the early weeks of the COVID-19 pandemic, shortages of personal protective equipment such as hand sanitizer and masks, and even household basics such as food and toilet paper, developed seemingly overnight. There was a sudden and pervasive sense of scarcity that occasionally led grocery store brawls for limited goods (Goodman & Chokshi, 2021; Kunkle & Ruane, 2020). At the same time, the dramatic extent of global lockdowns and early compliance with stay-at-home orders was also a testament to our capacity for widespread cooperation and recognition of our interdependence in battling the infectious disease.

An early review of the behavioral science implications of the pandemic named zero-sum thinking as a potentially critical barrier to forming an effective COVID response (Bavel et al., 2020). However, the extant literature could offer little more than an intuition of this problem. In this real-world, high-stakes situation, would a zero-sum mindset predict lower willingness to cooperate even when failure to cooperate could be deadly for oneself or others?

In Studies 7B - 7D, I examined whether a zero-sum mindset would predict lower willingness to cooperate during the COVID-19 pandemic. In Study 7B, I tested whether zero-sum mindset measured in US residents eight months before the onset of COVID-19 would predict lower cooperation with public health efforts to combat the disease. In Studies 7C - 7D, I also tested this hypothesis at a later stage in the pandemic in Belgium, examining whether zero-sum mindset would predict cooperation with public health efforts in general, and more specifically, by getting vaccinated.
Study 7B

In Study 7B, I tested the hypothesis that one’s general belief in life as a zero-sum game (measured in July of 2019 well before the first known cases of COVID) would predict strategic responses to dealing with the onset of the pandemic in the United States in March of 2020. To test this, I measured support for cooperation as both general attitudes, and as specific behavior.

Given the widespread experience of sudden scarcity at the outset of pandemic, I once again measured general preference for cooperation as a strategic response to scarcity. I also examined attitudes towards cooperation as a strategic response to COVID-19 specifically, and as attitudes towards compliance with public health efforts. Lastly, I also measured cooperation as behavioral compliance with public health recommendations for preventing the spread of disease. During March of 2020 in the United States, the primary way people could cooperate with public health efforts was by physically distancing themselves from others outside their household. Recommendations by the CDC to wear masks were not issued until April and vaccines were still many months away. Therefore, in this study I measured compliance primarily as “staying home” and “social distancing” behavior.

Moreover, I examine whether zero-sum mindset will predict cooperation with efforts to combat COVID-19 even beyond the effect of other variables found to be powerful predictors of public health compliance behaviors: sex: women found to be more compliant than men (Clark et al., 2020), education: those with more education tend to be more complaint than those with less education (Zhao et al., 2020); age: higher compliance with older age which also represented greatest relative risk of severe illness (CDC, 2020); income: higher income was highly predictive of one’s financial ability to follow orders like “sheltering in place” as well as access to medical care (Wright et al., 2020); and in the United States, political orientation, where public health compliance became highly politicized (Painter & Qiu, 2021).

Study 7B: Method

Participants and Procedure

Five hundred and four US residents recruited on the Prolific platform who gave informed consent and passed attention checks completed zero-sum mindset measures at Timepoint 1 in July of 2019. In this sample, 67% identified as white, 8% as Latinx/Hispanic, 7% as black/African American, 7% as Asian, 1% as Native American, 9% as other or preferred not to respond. Fifty-six percent of participants identified as female and 44% as male. Participant ages ranged 18-70, M_{age} = 33.39, SD = 11.07. All participants who completed Timepoint 1 measures were invited to another survey in March
of 2020 (Timepoint 2). From the original sample, 337 participants (approximately 67% of the original sample) also participated in the survey at Timepoint 2. Among this sample, 69% identified as white, 7% as Latinx/Hispanic, 7% as black/African American, 6% as Asian, 1% as Native American, 6% as mixed race or other. Fifty-six percent identified as female, 42% male, and 2% as other/non-binary or chose not to respond. Ages ranged from 18 to 69, $M_{age} = 34.88$, $SD = 11.66$.

**Measures**

**Zero-Sum Mindset**

Zero-sum mindset was measured using the five-item scale used in Study 6A (See Chapter 1).

**Cooperation Under Scarcity**

To measure general support for cooperation under scarcity, particularly cooperation in the form of commitment to caring for one another, participants rated agreement with two items “In times of scarcity, the best strategy for all of us is to take care of each other” and (reverse-scored) “In times of scarcity, the best strategy for all of us is to just take care of ourselves” rated on a scale from 1 - *Strongly disagree* to 5 - *Strongly agree*. ($r = -.44$).

**Strategic Response to COVID-19**

To examine strategic response to COVID-19 specifically, participants were asked to indicate along a spectrum “which statement best captures your attitude towards dealing with COVID-19” with the strategy of “every man for himself” on one side (0) and “we’re all in this together” on the other (100). The slider begins in the middle position (50) and participants drag in one direction or the other to indicate the strength of their endorsement of either statement.

**Support for Public Health Compliance**

Support for public health compliance was measured using two Likert-style items (e.g., “I think it is essential for everyone to follow public health recommendations during this pandemic” and (reverse-scored) “I don't think it matters if I follow the public health recommendations regarding ‘social distancing’ etc.”) rated on a scale from 1 - *Strongly disagree* to 5 - *Strongly agree*. ($r = .66$).

**Public Health Compliance Behavior**

To measure compliance behavior participants were asked “Are you currently staying at home (self-quarantine / ‘sheltering in place’)?” and indicated (yes or no). To gain a more granular measure
of compliance, participants were also asked how many times within the past 48 hours they had come within six feet of another person “excluding household members and excluding when necessary for an "essential job or behavior” such as grocery shopping.

**Demographic Variables**

Demographic measures of age, sex, income, education, and political orientation (on a spectrum from Conservative to Liberal and “other”) were also measured as control variables.

**Study 7B Results**

In Study 7B, I tested the hypothesis that zero-sum mindset measured in July of 2019 would predict cooperation with public health efforts to combat COVID-19 during the onset of the pandemic in the United States in March of 2020 using a series of linear and logistic multiple regressions.

First, examining the effect of zero-sum mindset on cooperation attitudes in general, I found that a general view of life as a zero-sum game predicted lower support for cooperation under scarcity ($\beta = -.30, p < .001$). This effect was little changed when controlling for education, sex, income, age, and political orientation ($\beta = .29, p < .001$).

Next, I examined whether those with a zero-sum mindset would predict lower support for cooperation specifically as a response to the emerging global crisis. Indeed, I found that participants’ general beliefs in a zero-sum game in 2019 predicted lower endorsement of the idea that “we’re all in this together” and stronger “every man for himself” attitudes towards dealing COVID in March of 2020 ($\beta = -.26, p < .001$). Again, this relationship was not meaningfully altered when controlling for education, sex, income, age, or political orientation ($\beta = -.25, p < .001$).

To test whether these attitudes would translate to the specific kind of cooperation needed most to battle the spread of the disease, I also investigated whether one’s zero-sum mindset measured the year before could predict whether or not they would try to comply with current public health recommendations. I found that those with a stronger zero-sum mindset were less likely to support behavioral compliance with public health guidance ($\beta = -.17, p = .003$), and similar results when controlling for education, sex, income, age, and political orientation ($\beta = -.16, p = .007$).

Examining specific compliance behavior, approximately 80% of participants reported that they were staying home while 20% reported that they were not. Using a logistic regression to predict the compliance behavior when controlling for age, income, education, sex, and political orientation, those with stronger zero-sum mindsets measured the year before were less likely to be following
shelter in place recommendations, odds ratio (OR) = .64, p = .008. This means that every unit increase on the zero-sum mindset scale (from 1 to 7) in 2019 predicted 36% lower odds of self-quarantining in 2020. Interestingly, in this case, adjusting for demographic control variables actually increased the predictive strength of zero-sum mindset for self-isolating behavior, which was weaker without any such controls (OR = .79, p = .10), suggesting that other variables, particularly political orientation, may partially mask the effect.

Beyond this binary distinction of self-quarantining or not, compliance could also vary in terms of the diligence applied to “social distancing,” defined as maintaining at least six feet of distance between oneself and other non-household members. Therefore, I also examined whether a zero-sum mindset would also predict less social distancing behavior measured as the specific number of times within the past 48 hours that they came within six feet of someone from outside their household.\(^\text{10}\) Social distancing behavior varied widely among participants, with many reporting zero instances of failure to keep space from others, while others reported up to 100 such instances, likely indicating attendance of a large social gathering. The average number of such reported failures to maintain distance was 3.74 (SD = 11.58). Examining the effect of zero-sum mindset measured on social distancing behavior, I found that every unit increase on the zero-sum mindset scale (1-7) measured in 2019 predicted approximately 1.6 additional instances of failure to social distance within a 48-hour period during March of 2020 (b = 1.6, \(\beta = .13, p = .027\)). In theory, each such instance represented a potential spread of the virus. As with self-quarantine behavior, this effect was slightly weaker without accounting for demographic variables (b = 1.3, \(\beta = .11, p = .059\)) and slightly stronger when predicting behavior from the contemporaneous measure of zero-sum mindset (b = 1.84, \(\beta = .16, p = .006\)).

Since the general hypothesis of this study is that one’s general belief that life is like a zero-sum game will predict lower cooperation even in situations where it is needed, these results use zero-sum mindset measured before the pandemic at Timepoint 1 (T1) to predict how someone will respond to the public crisis nearly a year later at Timepoint 2 (T2). But since zero-sum mindset was also measured at T2, we can also examine the cross-sectional relationship between one’s contemporaneous zero-sum mindset and cooperation during the pandemic. As relatively stable belief, zero-sum mindset at Timepoint 1 was highly correlated with zero-sum mindset at Timepoint 2 (\(r = .65, \text{ICC} = .78\)) and they were not significantly different in a paired samples t-test (\(t(336) = .01, p = .989\)). Therefore, all cross-sectional results demonstrate the same patterns as the longitudinal results,

\(^{10}\) Importantly, this question made it clear that instances that occurred because their job or similar circumstances required it should not be counted.
and with extremely similar coefficients. While in most cases the T2 measure was a slightly stronger predictor of T2 outcomes, as would be expected given the generally stronger relationship between measures collected contemporaneously; However, zero-sum mindset measured at T1 the year before was a slightly stronger predictor of self-quarantining behavior at T2 ($\Delta$OR = .04).

Moreover, all of these results remained significant when controlling for other variables known to be powerful predictors of public health compliance behaviors: sex, education, income, and political orientation. Indeed, political orientation often appeared to suppress the effect of one’s zero-sum mindset on compliance behavior.

**Studies 7C - 7D**

In Study 7B, I found that a zero-sum mindset measured in 2019 predicted lower willingness to cooperate with efforts to combat COVID in 2020. As the pandemic continued to unfold, the meaning of “cooperation” with public health efforts evolved as officials in different countries attempted to respond to variability in local infection rates, to the latest scientific developments in prevention efforts. In Studies 7C - 7D, I attempt to replicate the findings from Study 7B at a later stage of the pandemic and in a different cultural context: Belgium.

In Study 7C, I once again examine whether a generalized zero-sum belief will predict lower strategic preference for cooperation in a large nation-wide survey of 1,523 Belgian residents conducted online in French, Flemish and English during the Spring of 2021. In Study 7D, I replicate this in a city-wide survey of 1,366 residents in a Belgian city administered in collaboration with city officials during the summer and fall of 2021.

While in March of 2020 (Study 7B), the most important form of cooperation was staying home and maintaining physical distance from others, by 2021 the most important form of cooperation with public health efforts was to receive one of the recently approved COVID vaccines. Therefore, in Study 7C and 7D, cooperative compliance behavior is operationalized as getting vaccinated.

**Study 7C - 7D: Method**

**Participants and Procedure**

**Study 7C**

One thousand five hundred and twenty-three Belgian residents recruited using the online platform Pollfish gave informed consent and completed the survey, passing all attention checks.
Among this sample, 73% were Belgian with Belgian heritage, 6% were Belgian with other European heritage, 4% Belgian with North African heritage, 1% Belgian with Sub-Saharan African heritage, 7% Belgian with other heritage, for those who identified as non-Belgians, 5% were European heritage, < 1% African heritage, and 3% other heritage; 40% identified as female, 59% male, and < 1% as non-binary/other. Participants could take the survey in either French, Flemish or English. The measures, originally developed in English, were translated into French and Flemish by a professional translation service and checked for comprehension by local partners fluent in these languages. Ages ranged 18-74, \( M_{age} = 38.52, SD = 14.76 \).

**Study 7D**

One thousand three-hundred and eighty-seven residents of a major Belgian city\(^\text{11}\) were recruited to the survey in collaboration with local government efforts. Participants were recruited using a variety of methods to maximize survey uptake across the city, including mailing an invitation to participate to each physical address in the city, online advertising, flyers, social media promotions and cinema vouchers to incentivize participation. The survey default language was French, but participants could also take the survey in Flemish or English. Sixty-eight percent of participants completed the survey in French, 18% in Flemish, and 14% in English. Participants who did not pass the attention check but completed the survey still received a cinema voucher, but their data was excluded from analysis. In addition to this, we removed participants who reported having already taken the survey for any reason which removed a further 11 participants. Ten participants who reported being under age 18 were also excluded from the sample for a final sample of 1366 participants. Participants’ ages ranged from 18 to 96, \( M_{age} = 44.1 \) years old, \( SD = 14.2 \). Fifty-one percent of participants identified as Belgian with Belgian heritage, 5% as Belgian of other European heritage, 5% as Belgian with North African heritage, 1% as Belgian with Sub-Saharan African heritage, 2% as Belgian with other heritage, for those who identified as non-Belgian, 24% were European, 2% Latin American, 2% Asian, 1% Middle Eastern, 1% Sub-Saharan African, and 5% other. Approximately 54% identified as female, 45% as male and less than 1% as “other” or chose not to respond. Participants could choose not to answer certain questions or leave the survey at any time resulting in missing values for different measures. Varying degrees of freedom in various analyses are due to such missing values.

\(^{11}\) City officials requested that the city not be named
Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 5-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - *Strongly disagree* to 7 - *Strongly agree*.

Cooperation Under Scarcity

Strategic response to scarcity was measured using the same scales used in Study 7B.

Strategic Response to COVID-19

Strategic response to scarcity was measured using the same measure used in Study 7B.

Support for Public Health Compliance

Support for public health compliance was measured using two Likert-style items (e.g., “I think it is essential for everyone to follow public health recommendations during this pandemic” and (reverse-scored) “I don't think it matters if I follow the public health recommendations regarding ‘social distancing’ etc.”) rated on a scale from 1 - *Strongly disagree* to 5 - *Strongly agree* ($r = .66$).

Public Health Compliance Behavior

Public health compliance behavior was measured as whether or not someone had been vaccinated against COVID-19 (“No” responses coded as 0, and “Yes” responses coded as 1).

Demographic Variables

To control for demographic variables, participants reported age, sex, income, and education.

Studies 7C - 7D: Results

To investigate whether the relationship between zero-sum mindset and cooperation with efforts to combat COVID-19 would also extend to another cultural context at a later stage in the pandemic, I tested the same hypotheses from Study 7B in two Belgian samples using the same linear and logistic multiple regressions. First, I examined the effect of zero-sum mindset on support for cooperation in general and found that a seeing the world through a zero-sum lens predicted uncooperative attitudes in both Studies 7C and 7D (7C: $\beta = -.27, p < .001$; 7D: $\beta = -.30, p < .001$). This
effect was little changed when controlling for education, sex, income, and age (7C: $\beta = -0.27, p < .001$; 7D: $\beta = -0.27, p < .001$).

Next, I investigated whether a zero-sum mindset would predict lower support for cooperation as the best strategy specifically for dealing with the pandemic. Once again, I found that participants’ general beliefs in a zero-sum game in predicted lower commitment to cooperation as the response to dealing COVID (7C: $\beta = -0.21, p < .001$; 7D: $\beta = -0.22, p < .001$), and this relationship remained essentially unchanged when controlling for education, sex, income, and age (7C: $\beta = -0.20, p < .001$; 7D: $\beta = -0.22, p < .001$).

I then tested whether a zero-sum mindset would also predict support for cooperation in the form of compliance with public health recommendations in Belgium. In both Studies 7C and 7D, the general belief that success for one person means failure for someone else predicted lower support for public health efforts to combat COVID-19 (7C: $\beta = -0.30, p < .001$, 7D: $\beta = -0.20, p < .001$) and this effect was also robust when controlling for education, sex, income, and age (7C: $\beta = -0.26, p < .001$; 7D: $\beta = -0.17, p < .001$).

Finally, I examined compliance behavior by testing whether a zero-sum mindset would predict vaccination status in a logistic regression. In Study 7C, I found that for every unit increase in someone’s zero-sum mindset (on a scale from 1 to 7) their odds of being vaccinated were 26% lower, and 27% lower when accounting for education, sex, income, and age (OR = 0.74, $p < .001$; OR = 0.73, $p = .006$). In Study 7D, these odds were 27% lower for each unit increase in zero-sum mindset, and 19% lower when accounting for education, sex, income, and age (OR = 0.73, $p < .001$; OR = 0.81, $p = .02$). Illustrating the robust pattern of zero-sum mindset’s effect on cooperation, the forest plot in Figure 7.1 displays the unique effect of zero-sum mindset on each measure of support for cooperation from each study when controlling for demographic variables.
**Figure 7.1**
Unique Effect of Zero-Sum Mindset on Cooperation During COVID-19

<table>
<thead>
<tr>
<th>Study</th>
<th>Estimates [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>USA (Panel Data)</td>
<td>-0.29 [-0.40, -0.18]</td>
</tr>
<tr>
<td>Belgium 1</td>
<td>-0.27 [-0.33, -0.21]</td>
</tr>
<tr>
<td>Belgium 2</td>
<td>-0.27 [-0.33, -0.21]</td>
</tr>
<tr>
<td><strong>COVID</strong></td>
<td></td>
</tr>
<tr>
<td>USA (Panel Data)</td>
<td>-0.25 [-0.36, -0.14]</td>
</tr>
<tr>
<td>Belgium 1</td>
<td>-0.20 [-0.26, -0.14]</td>
</tr>
<tr>
<td>Belgium 2</td>
<td>-0.22 [-0.28, -0.16]</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td></td>
</tr>
<tr>
<td>USA (Panel Data)</td>
<td>-0.16 [-0.27, -0.05]</td>
</tr>
<tr>
<td>Belgium 1</td>
<td>-0.26 [-0.32, -0.20]</td>
</tr>
<tr>
<td>Belgium 2</td>
<td>-0.17 [-0.23, -0.12]</td>
</tr>
</tbody>
</table>

Regression Coefficients $\beta$ controlling for age, income, education, sex, and political orientation (US)

Note. Type of cooperation and Study labels are organized along the y-axis. In the USA (Panel Data) sample, zero-sum mindset at Timepoint 1 (July 2019) was used as the predictor, and control variables included political orientation. Belgium 1 represents Study 7C and Belgium 2 represents Study 7D. Horizontal bars represent 95% confidence intervals. “General” represents general preference for cooperation as a strategic response to scarcity. “COVID” represents preference for cooperation as a strategic response to the pandemic. “Compliance” represents attitudes towards cooperating with recommended public health compliance behaviors (e.g., social distancing).
Discussion

In Chapter 7, I found that, in keeping with the strategic logic of playing a zero-sum game, those who see the world as a zero-sum game are less likely to value cooperation. In particular, in Study 7A, I found that those with stronger zero-sum mindset were less likely to see cooperation as effective strategic response to scarcity even when controlling for all Big Five personality traits, primal world beliefs, and demographic variables such as education, income, sex, and age. If a zero-sum mindset reduces cooperation, we expect its consequences to be particularly felt in situations and domains where cooperation is needed most. The onset of the COVID-19 pandemic represented just such a situation.

In Study 7B, I found that a zero-sum mindset, measured the year before the pandemic, predicted lower cooperation, both as attitude and as public health compliance behavior, during the pandemic. In Studies 7C and 7D, I replicated these findings in another cultural context at a later stage in the pandemic. Collaborating with a local government in Belgium, Study 7D used a wide variety of recruitment methods, including mailing invitations to the survey to every physical address in this major Belgian city. Both of these studies in Belgium replicated results in the US, finding that zero-sum mindset predicted lower cooperation with collective efforts to combat the disease.

Remarkably, in all outcome variables in all studies, zero-sum mindset was a better predictor of compliance with COVID prevention efforts than even age, which was understood from the outset of the pandemic in the US to be the single greatest risk factor for hospitalization and death from COVID-19 (Henkens et al., 2022).12 In other words, this evidence suggests that a zero-sum mindset, and its denial of the ways in which our fates are linked, was a better predictor of cooperation with COVID prevention efforts even above one’s objective risk of serious disease or death.

These findings underscore the potentially self-sabotaging effects of a zero-sum mindset. Though cooperation may not always be the appropriate strategic response to a situation, a generalized resistance to cooperation may undermine the growth and connection that underpin human flourishing.

12 This does not include vaccination status measured in Study 7C in the spring of 2021; since age was an early eligibility criterion for vaccination in Belgium, age was a stronger predictor of vaccination in this sample. However, by Summer/Fall of 2021 (Study 7D) all adults had access to vaccines in Belgium and by this time age was no longer a significant predictor in the full model.
Zero-Sum Mindset & Individual Success
Chapter 8

Zero-Sum Mindset and Individual Success

In Chapters 1 - 7, I found that a generalized belief that success in life is zero-sum predicts specific zero-sum beliefs, its cognitive corollaries, and strategic implications across a wide range of domains and situations. In theory, a zero-sum mindset predicts simpler cognitive processing styles, heightened perception of hostility, and less cooperative behavior because these cognitive and behavioral responses would be most beneficial in a real zero-sum situation. However, as previously discussed, most situations are not truly zero-sum, and even fewer are purely zero-sum. So, while a zero-sum mindset may emerge as a mental model for self-interest or self-protection, if this mindset fails to accurately model most situations one encounters, it is also unlikely to lead to success. In this chapter, I examine whether a zero-sum view of success ultimately predicts better or worse outcomes for the individuals with this mindset. In Study 8A, I examine the effect of zero-sum mindset on economic success and subjective status over time. In Study 8B, I examine broader emotional success as one’s general satisfaction with life.

Study 8A

One might expect a zero-sum view of the world, and the cut-throat competitive attitude it implies, to lead to economic success. However, this assumption would neglect the essentially non-zero-sum nature of economic growth. Since a zero-sum mindset is also characterized by belief in fixed scarcity, this mindset may systematically neglect opportunities for growth, particularly those opportunities that may arise from cooperation (See also Chapter 6 and Chapter 7).

Indeed, ccorrelational evidence finds a negative relationship between zero-sum thinking and economic success at both the macro-level, measured as national GDP, and micro-level, measured as household income (Różycka-Tran et al., 2015, 2019). While these authors interpret this correlation to suggest that economic failure gives rise to zero-sum beliefs, as “an easy and self-serving way to explain one’s own failures” (2015), it is also possible that the causality may flow in the opposite direction, with stronger zero-sum beliefs, which discourage cooperation, leading to lower economic growth over time. To test this, in Study 8A, I conducted a prospective study examining changes in zero-sum mindset and income over time. I hypothesized that a higher zero-sum mindset at Timepoint 1 would predict lower objective economic status at Timepoint 2 controlling for baseline income at Timepoint 1.
While this study attempts to demonstrate a prospective and not merely cross-sectional or retrospective effect of zero-sum mindset on economic prosperity, it does not deny that the psychological experiences of economic deprivation, particularly relative deprivation, could strengthen one’s zero-sum mindset. Indeed, previous research has documented that upward comparisons of subjective status can increase zero-sum thinking (Ongis & Davidai, 2021). Therefore, I also hypothesized (pre-registered) that perceived declines in relative socioeconomic status would also predict increases in zero-sum mindset.

Study 8A Method

Participants & Procedure

Nine months after the initial data collection at Timepoint 1, all participants who successfully completed Study 1 were invited through the CloudResearch platform to participate in this study. Forty-three percent of the participants from Timepoint 1 also completed measures at Timepoint 2 (for a total N = 353 participants, n = 706 observations). Participants were 72% White, 10% Black/African American, 6% Latin/Hispanic, 5% Asian/South Asian, and 7% Other; 54% female; Ages ranged 18-72, $M_{age} = 36.97$, $SD = 12.12$. Comparing participants who completed both surveys with those who only completed the first survey, I found no significant differences in terms of income, education, sex, or age.

Measures

Income

Participants reported their current total household income $USD at both Timepoint 1 and Timepoint 2 on a scale from less than $10,000 to $200,000+. Participants’ reported income ranged from less than $10,000 to $200,000+ with a median reported income of $55,000 at Timepoint 1.

Dynamic Subjective Status

Subjective status and dynamic subjective status were measured using the MacArthur Subjective Socioeconomic Status scale (Adler et al., 2000). The scale uses an image of a ladder to represent where people stand relative to others (in this case, the United States) in terms of status, with those at the top (9) having the most wealth and respect, and those on the bottom having the least (1) and asks participants to indicate where on the ladder they see themselves. Dynamic Subjective Status was measured using a modified version of this scale in which participants are asked to rate their perceived relative status when thinking back to different times in their life (e.g., "right now", "one
year ago” and “five years ago”). Perceived dynamic status was calculated as the difference in ratings between the ratings for current and past status such that higher numbers represent perceived growth in status and negative numbers represent perceived decline in status over the past year.

**Study 8A Results**

Using multiple linear regression, I tested whether a stronger zero-sum mindset would predict worse economic outcomes over time. As predicted, I found that stronger zero-sum mindset at Timepoint 1 predicted lower income at Timepoint 2, even when controlling for baseline income (β = -.07, 95% CI [-.11, -.02], SE β = .02, t = -2.90, p = .004). In general, this effect does not appear to be driven not by losses incurred by those with zero-sum mindsets, but rather by the relatively lower growth they experienced over the same time period. While those with the highest zero-sum mindsets earned approximately $1,129 more than they had the year before (2% increase), those with the lowest zero-sum mindsets earned approximately $8298 more (13% increase). To test the robustness of this relationship, I also controlled for the number of household members, number of household wage earners, sex, race, educational attainment, and parental educational attainment, and found that the relationship was essentially unchanged (β = -.06, 95% CI [-.11, -.02], SE β = .02, t = -2.60, p = .009).

Next, I compared the predictive power of the prospective measure of zero-sum mindset (Timepoint 1) to the cross-sectional measure (Timepoint 2). Given the high correlations between measures of zero-sum mindset at both Timepoints, they are also both significant predictors of change in income. However, when including both measures as predictors of income change in the model, only zero-sum mindset at Timepoint 1 remains a significant predictor (β = -.07, p = .04), while zero-sum mindset at Timepoint 2 becomes non-significant (β = -.001, p = .98), indicating that that one’s mindset nearly a year earlier (prospective) was a better predictor of whether their income would rise or fall than their mindset after the same time period. I also examined whether changes in income would predict increases in zero-sum mindset over the course of the year and found no effect (p = .96). Though more research is needed to make stronger causal inferences about this relationship and to unpack the potential causal mechanisms, this evidence suggests that a zero-sum mindset may contribute to declines in income over time and not merely as a response to it.

Though changes in objective economic status did not predict changes in zero-sum mindset, I found that the perception of changes in one’s relative socioeconomic status did. The difference in subjective status “now” compared to “one year ago” predicted small changes in zero-sum mindset.

13 Dichotomized by +/- 1SD above and below the mean respectively
over approximately the same time period such that relative declines or even relatively smaller climbs on the status ladder predicted stronger zero-sum beliefs at Timepoint 2 compared to Timepoint 1 ($\beta = .09, p = .016$). However, perceived status changes over a longer time horizon (“5 years ago”) did not ($\beta = .02, p = .67$).

Exploring possible mechanisms in Study 8A, I found that one of the only other significant predictors of change in income over time was trust, which was also negatively related to zero-sum mindset. While personal forms of trust in family and friends had only trending positive relationship to change in income (interpersonal trust $\beta = .03, p = .09$), institutional and general forms of trust such as trust in business, trust in government, trust in the justice system, and trust in strangers, was stronger (institutional trust $\beta = .06, p = .007$) with higher trust predicting increases in income.

**Studies 8B - 8C**

Study 8A demonstrated that seeing success as a zero-sum game was associated with lower economic success over time. But of course, wealth and socioeconomic status are not the only way people think about what it means to be successful in life. When people define success for themselves, people assign more weight to their overall quality of life and relationships than to status and finance (Gallup & Populace, 2019). Previous research has also found that economically-oriented zero-sum beliefs about success (BZSG) are associated with lower satisfaction with life across 35 countries (Różycka-Tran et al., 2015), suggesting that a generalized view of success as zero-sum might bear a similar relationship. Therefore, in Studies 8B and 8C, I examine whether a zero-sum mindset will predict success according to people’s own overall assessments of their general “satisfaction with life” beyond the effect of material success or achievement.

**Studies 8B - 8C Method**

**Participants and Procedure**

Descriptions of participants (8B: $N = 1523$; 8C: $N = 1366$ and Belgian residents) and recruitment methods for Studies 8B and 8C are described Table A1, Samples 16 and 17.

**Measures**

**Zero-Sum Mindset**

Zero-sum mindset was measured using the same 7-item scale described in Chapter 1.
Satisfaction with Life

To measure satisfaction with life, participants responded to a single item: “Thinking about your own life and personal circumstances, how satisfied are you with your life as a whole?” (Cheung & Lucas, 2014). Responses options ranged from 1 - Extremely dissatisfied to 5 - Extremely satisfied.

General Health

General health was measured using the single-item measure: “In general, would you say your physical health is poor, fair, good, very good, or excellent?” (Barger, 2006; Ware & Sherbourne, 1992) with corresponding response options scored from 1 to 5.

Demographic Variables

To control for demographic variables, participants reported their age, sex, income, and education.

Studies 8B - 8C Results

To examine whether those with a zero-sum mindset feel more or less satisfied with their lives, I examined the zero-order correlation between zero-sum mindset and satisfaction with life and found a negative relationship in both Study 8B (r = -.14, p <.001) and Study 8C (r = -.21, p <.001). Next, I used multiple linear regressions to control for other important predictors of satisfaction with life such as income, education, and one’s general health. I found that beyond the effect of these variables, the belief that success is like a zero-sum game predicted lower satisfaction with life in both Study 8B (β = .15, p < .001) and 8C (β = .13, p < .001).

Moreover, the effect of zero-sum mindset on life satisfaction was similar to the unique effect of economic success (β = .14) in Study 8B and stronger than economic success (β = .10) in Study 8C. When comparing the effect of zero-sum mindset to other forms of success on satisfaction with life, such as educational attainment, I find also that zero-sum mindset is a stronger predictor of life satisfaction than the unique effect of educational attainment in both Studies 8B (β = .02, p = .54) and 8C (β = .10, p < .001).

I also explored whether trust might also mediate the effect of zero-sum mindset on life satisfaction such that the lower trust predicted by a zero-sum mindset. In this case, interpersonal trust was the strongest predictor (Study 8B: β = .30, Study 8C: β = .19, ps <.001 controlling for education and income), and appeared to at least partially mediate the effect of zero-sum mindset on life.
satisfaction in a simple mediation analysis (8B: indirect effect = .07, \( p < .001 \), direct effect = .08, \( p < .003 \), total effect = .15, \( p < .001 \); 8C: indirect effect = .05, \( p < .001 \), direct effect = .17, \( p < .001 \), total effect = .22, \( p < .001 \)). However, since these results are exploratory and correlational, more research is needed to investigate whether or how trust might have mediated these effects.

**Discussion**

In Chapter 8, I found evidence that a zero-sum mindset undermines both economic and emotional success. Exploring potential mechanisms suggested that these deficits in wealth and satisfaction may be at least partially explained by deficits in trust. This would be consistent with the broader literature which finds trust to be an essential component of economic growth (Fukuyama, 1995). The potential mechanism is also reflected in Study 6F where I found that a zero-sum mindset predicted lower behavioral trust even in a situation where trusting was required for growth, leading to lower earnings. Trust, particularly interpersonal trust, has also been found to be an important ingredient for one’s overall satisfaction with life (Tokuda et al., 2008). Since a great deal of quality of life is determined by the health of one’s interpersonal relationships (Amati et al., 2018), and interpersonal trust is an essential component of those relationships (Rempel et al., 1985), one way a zero-sum mindset may negatively impact one’s overall satisfaction with life is by compromising the quality of one’s connections to others. Future research may wish to examine this more directly.

This study also suggests that a zero-sum mindset may impact objective economic status and subjective status through a cycle of recursive processes. While objective changes in income did not predict changes in zero-sum mindset, zero-sum mindset predicted lower income over time which also corresponded to lower perceived status. Yet, the perception that one’s general success declined, or failed to rise as much as others, did predict increases in zero-sum mindset. Taken together, this evidence suggests the possibility that zero-sum mindsets could lead to a vicious cycle whereby a zero-sum mindset inhibits the trust and cooperation needed for economic growth, which leads to both the reality and perception that others are making relatively greater socioeconomic gains, promoting a perception that one’s status is declining compared to others, which then reinforces a zero-sum mindset. However, given that this prospective evidence remains observational, more research is needed to make causal inferences.

As highly social creatures, both our material and emotional success depends largely on our relationships with others. To view these relationships as a zero-sum game, such that others are viewed more as potential rivals than as potential collaborators, may stifle the social trust and cooperation that often underpins our personal and professional success.
This sum of forces can arise only where several persons come together: but, as the force and liberty of each man are the chief instruments of his self-preservation, how can he pledge them without harming his own interests? ... The problem is to find a form of association which will defend and protect with the whole common force the person and goods of each associate... This is the fundamental problem of which the Social Contract provides the solution... Each of us puts his person and all his power in common under the supreme direction of the general will, and, in our corporate capacity, we receive each member as an indivisible part of the whole.

Chapter 9

Zero-Sum Mindset & Democratic Erosion

Collective action is often threatened by apparent conflicts of interests between different members and groups in society. The democratic process offers an effective method of coordinating such divergent interests—striving to resolve opposing interests in a constructive manner that promotes the common good. Commitments to democracy stands as a fragile safeguard against both the authoritarianism of oppressive autocrats and the lawlessness of anarchy (Dahl & Shapiro, 2015).

Unlike authoritarian regimes that are often maintained through force and intimidation, a democracy is only as strong as its citizens' shared commitment to democratic principles and processes. Nevertheless, global commitment to democratic principles appears to be backsliding, often to alarming effect (Diamond & Plattner, 2015; Foa & Mounk, 2016; Zilinsky, 2019 for dissenting interpretation). This erosion of democratic principles and institutions around the world has been accompanied by the rise of authoritarian leaders (Levitsky & Ziblatt, 2018). Even in the United States and Europe—home to some of the world’s most enduring democracies — democratic principles routinely come under attack (“Freedom in the World: ‘Democracy Under Siege,’” Freedom House, 2021).

Democratic backslide is generally understood to be the result of weakened accountability which gives people outside of government the power to remove unpopular leaders (e.g., through elections) and which give institutions within government the power to impose a structure of checks and balances (e.g., through institutional democratic norms such as judicial oversight) (Lührmann et al., 2020). As such, the erosion of democratic accountability can be passive (e.g., failing to participate in essential democratic collective actions such voting) or active (e.g., violating core democratic principles such as the rule of law or non-violent civil discourse).

Several social forces are thought to underlie current manifestations of Democratic erosion, including various forms of “authoritarian populism” (i.e., social movements that seek to dismantle protections of pluralism in order to, ostensibly, safeguard “the people” from threats of “elites”) and “pernicious polarization” (i.e., polarization that bifurcates all of society into two warring partisan camps) (McCoy & Somer, 2019; Roberts, 2021). While both populism and partisanship can potentially benefit democracy when they help hold ruling elites accountable to popular concerns or drive public engagement to political issues (Akkerman, 2003; Cholbi, 2019), they can also threaten people’s commitment to democratic principles when losing sight of the superordinate value of the
democratic process (Roberts, 2021). In other words, when people’s commitment to partisan or populist goals trumps their commitment to democratic principles, democracy may be in danger. Consequently, understanding the psychological processes that increase or decrease such commitments may be instrumental to protecting the health of our democracies.

I propose that underlying people’s commitment to democratic principles is an (often implicit) belief that social relationships are zero-sum. Specifically, I propose that a zero-sum mindset—*the belief that one person or group’s success must come at others’ expense*—denies the broad interdependence of interests upon which the “social contract” rests and thus weakens people’s support of and commitment to democratic principles. Moreover, I propose that this view of negative interdependence between members of a society impacts commitment to democratic principles *beyond* the effects of political ideology and political identity.

Following insights from game theory, which articulates the structural relationships between players and incentives in dynamic interactions in order to solve for the best strategic solution, games can be either *zero-sum*, where rewards are fixed such that gains for one player are offset by losses by another player, or *non-zero-sum*, where more than one player can gain or lose together. In this way, we see that the social contract depends upon a view of social relationships that is essentially *non-zero-sum*. Indeed, one of the most prominent discourses on the social contract in recent decades compares the social contract to the classic game theory paradigm “The Prisoner’s Dilemma”, arguing that the *best* outcomes for all players must be achieved through a shared understanding of the higher order *integration* of players’ interests that subsumes individual interests, ultimately forging commitment to the social contract (Gauthier, 1986). Put differently, people’s commitment to the social contract of democracy depends upon their recognition that their success as individuals ultimately depends upon the success of the society in which they operate. Therefore, recognizing the *positive sum* outcomes that can emerge from our democratic cooperation, or even the potentially *negative sum* outcomes that can result from the breakdown of this cooperation, can be instrumental to our commitment to democratic principles and processes.

**Is Democracy a Zero-Sum Game?**

Although any given democratic process may contain some truly zero-sum aspects (e.g., the U.S. electoral system creates a zero-sum contest between two candidates such that one can only succeed), the process, as a whole, may not necessarily be zero-sum. For example, although candidates may improve their chances of winning an election by engaging in a smear campaign against their rivals, doing so may prove to be negative sum if it erodes the public trust in government and makes it
difficult to achieve political goals while in office. Similarly, representatives’ decisions to vote in favor or against a particular policy may be zero-sum, but the process of integrating and conceding opposing parties’ interest when sponsoring a bill through Congress can be positive sum, creating net benefits for most or all parties involved. And, to the extent that most people have a vested interest in the endurance of their electoral system, any specific zero-sum election is embedded within a non-zero-sum desire for a robust political system. Simply put, the integration of different interests in a society, which is at the heart of effective policy making, is not a zero-sum game.

That being said, while the democratic process is not necessarily zero-sum, people may still view it as such. Consequently, a zero-sum mindset may lead to disenchantment with the whole political system, eroding people’s commitment to democratic principles by reducing their participation in the democratic process (e.g., voting) and motivating their engagement in destructive, non-normative forms of political engagement (e.g., disenfranchisement, physical violence, or intimidation). Thus, I hypothesized that zero-sum beliefs predict weaker commitment to democratic principles and participation and anti-democratic strategies for achieving political goals. Specifically, I propose that zero-sum beliefs about social relationships will predict both populist zero-sum beliefs (i.e., that “elites” benefit at the expense of “the people”) and partisan zero-sum beliefs (i.e., that each political party benefits at the expense its opponents) which may undermine commitment to the Democratic process. Importantly, I hypothesize that the effects of zero-sum beliefs on people’s commitment to democratic principles will be exhibited beyond any effect of political identity, ideology, or even partisan animosity.

**Overview of the Present Research**

In this research, I investigated the overarching hypothesis that a zero-sum mindset predicts greater willingness to undermine democracy. In Studies 9A - 9E, I tested the hypothesis that a zero-sum mindset predicts lower commitment to Democratic values and antidemocratic behavior over and above one’s political identity or the strength of their political ideology.

I examined this in two democracies: The United States and Belgium. While both countries are Western liberal democracies generally considered to have strong democratic traditions, they differ in important ways politically (Belgium is a federal constitutional monarchy with a multi-party system and the US is a federal constitutional republic with a two-party system) and demographically with different historical cleavages between various groups. In the US, 5,549 unique participants were sampled across four years (2018 - 2022) including a sample (Study 9C) collected in the US on the day of the 2020 Election. In Belgium, data was collected from 2,889 unique participants using
country-wide online recruitment, and also as part of a city-wide survey in collaboration with the European Forum for Urban Security and officials of a major city in Belgium in 2021.


In Study 9I, I examine more specific zero-sum beliefs: zero-sum populist beliefs and zero-sum partisan beliefs, and whether these different ways of thinking about social relationship as zero-sum mediate or moderate the relationship between zero-sum mindset and anti-democratic behaviors that operate both inside and outside of the political system.

Finally, in Study 9J, I investigate whether this phenomenon might extend across cultural contexts by examining the relationship between zero-sum mindset and country-level indicators of democratic flourishing or democratic backslide.

**Studies 9A- 9E: Anti-Democratic Attitudes and Behaviors**

In Studies 9A - 9E, I examine the hypothesis that zero-sum mindset will predict lower commitment to fundamental democratic values such equality, voting rights, and fair democratic process, and greater participation in anti-democratic behavior, both in the US and Belgium. I also examine whether zero-sum mindset will predict these antideocratic attitudes and behaviors beyond the effect of political identity or ideology.

In the US, democratic/anti-democratic behavior was measured prospectively (i.e., *I would support this behavior*), and in Belgium, retrospectively (i.e., *I have done this behavior*).

Furthermore, in the US, behavioral inventories focused on interpersonal engagement, that is, civility and incivility between members of different partisan groups. This included social (e.g., “avoiding social interaction”, “working together”), epistemic (e.g., “sharing unreliable information to make outgroup members look bad”, “pointing out valid concerns” of outgroup members), and
physical (e.g., “physically pushing or hitting”, “physically defending” an outgroup member) forms of hostility and cooperation targeting participants’ selected outgroups.

In Belgium, behavioral inventories focused on forms of political engagement, including informal, issue-based political engagement (e.g., “gave time to learn more” about a political issue), formal political behaviors (e.g., “contacted elected officials”), informal political activism (e.g., “attended a protest”), and overtly destructive forms of political activism (e.g., “destroyed property as demonstration” and “physical intimidation or violence”).

**Study 9A - 9E Method**

**Participants & Procedure**

**Study 9A**

Eight hundred and twenty-one U.S. residents recruited using Amazon Mechanical Turk (MTurk) gave informed consent, passed attention checks, and completed the study (70% White, 13% Black/African American, 5% Asian/South Asian, 6% Latin/Hispanic, and 6% Other; 52% female; Ages ranged 18-72, $M_{\text{age}} = 34.54$, $SD = 10.66$). (Table A1, Sample 1)

**Study 9B**

Three hundred US residents were recruited on the Prolific platform using pre-screening to recruit an even number of members of the major opposing political parties, 150 participants who identified as Republicans and 150 who identified as Democrats. Among these, 50% identified as female, 49% as male, < 1% as non-binary/other, and 73% as white, 13% as Asian, 6% as Latinx/Hispanic, 6% as black or African American, >1% as Indigenous/Native American, and 2% other. Ages ranged 18-76, $M_{\text{age}} = 34.69$, $SD = 13.07$. (Table A1, Sample 12)

**Study 9C**

Using pre-screening to recruit an even number of members of the major opposing political parties, 455 US residents recruited on Prolific completed the online study. Three hundred and fifty-one (77%) identified as white, 37 (8%) as Asian, 31 (7%) as black/African American, 23 (5%) as Latinx/Hispanic, 2 (>1%) as Indigenous/Native American, and 11 (2%) as other; 56% identified as female; Ages ranged 18-73, $M_{\text{age}} = 34.39$, $SD = 12.98$. (Table A1, Sample 16)
Study 9D

One thousand five hundred and twenty-three Belgian residents recruited using the online platform Pollfish completed the survey. Among this sample, 73% were Belgian with Belgian heritage, 6% were Belgian with other European heritage, 4% Belgian with North African heritage, 1% Belgian with Sub-Saharan African heritage, 7% Belgian with other heritage, for those who identified as non-Belgians, 5% were European heritage, < 1% African heritage, and 3% other heritage; 40% identified as female, 59% male, and < 1% as non-binary/other. All participants in this sample \( (N = 1,523) \) completed measures of zero-sum mindset and support for democratic principles. However, a smaller number of participants were randomly assigned to complete a longer survey that included the full inventory of democratic behaviors and support for various social movements \( (N = 1,040) \), resulting in different degrees of freedom for these analyses. Participants could take the survey in either French, Flemish or English. Ages ranged 18-74, \( M_{\text{age}} = 38.52, SD = 14.76 \). (Table A1, Sample 17)

Study 9E

One thousand seven hundred and sixty-six residents of a major Belgian city\(^{14} \) were recruited to the survey. Participants were recruited using a variety of methods to maximize survey uptake across the city, including mailing an invitation to participate to each physical address in the city, online advertising, flyers, social media promotions and cinema vouchers to incentivize participation. The survey default language was French, but participants could also take the survey in Flemish or English. Sixty-eight percent of participants completed the survey in French, 18% in Flemish, and 14% in English. Among this sample, 1387 participants also passed an “attention check.” Participants who did not pass the attention check but completed the survey still received a cinema voucher, but their data was excluded from analysis. In addition to this, I removed participants who reported having already taken the survey already for any reason which removed a further 11 participants leaving a sample of 1376 participants. Ten participants who reported age under 18 were excluded from the sample for a final sample of 1366 participants. Participants’ ages ranged from 18 to 96, \( M_{\text{age}} = 44.1 \) years old, \( SD = 14.2 \). Fifty-one percent of participants identified as Belgian with Belgian heritage, 5% as Belgian of other European heritage, 5% as Belgian with North African heritage, 1% as Belgian with Sub-Saharan African heritage, 2% as Belgian with other heritage, for those who identified as non-Belgian, 24% were European, 2% Latin American, 2% Asian, 1% Middle Eastern, 1% Sub-Saharan African, and

\(^{14} \) City officials requested that the city not be named
5% other. Approximately 54% identified as female, 45% as male and less than 1% as “other” or chose not to respond. Participants could choose not to answer certain questions or leave the survey at any time resulting in missing values for different measures. Varying degrees of freedom in various analyses are due to such missing values. (Table A1, Sample 18)

Measures

Zero-Sum Mindset

In Study 9A, zero-sum mindset was measured using the 5 items selected and adapted from the BZSG scale (Chapter 1) to measure general belief that life is like a zero-sum game (e.g., “Life is such that when one person gains, someone else has to lose”). The scale uses Likert-style response items on a scale from 1 (strongly disagree) to 7 (strongly agree) (Cronbach's $\alpha = .90$, $\omega = .91$). In all other studies, two reverse-key items (e.g., “One person’s success is not another person’s failure.”) were added to help balance the scale for acquiescence, resulting in a 7-item scale ($\alpha$ ranged from .77 to .91, $M_\alpha = .86$; $\omega$ ranged from .78 to .91, $M_\omega = .87$) administered in English, French and Flemish.

Attitude Measures

Anti-egalitarianism (Social dominance orientation)

Social Dominance Orientation was measured using the SDO-7 (Ho et al., 2012), an eight-item Likert-style scale. (Example item: “An ideal society requires some groups to be on top and others to be on the bottom.”) Responses ranged from strongly disagree to strongly agree (5). (1A: $\omega = .87$; 1D: $\omega = .72$; 1E: $\omega = .74$).

Disenfranchisement

Disenfranchisement/low commitment to equal voting rights was measured using four Likert-style items (e.g., “Some groups should not be allowed to vote” and reverse-scored items, e.g., “I would defend the right of my political opponents to vote”). Response options ranged from strongly disagree (1) to strongly agree (7) (1B: $\omega = .82$; 1C: $\omega = .76$; 1D: $\omega = .77$; 1E: $\omega = .77$).

Willingness to Undermine the Democratic Process

Commitment to democratic process was measured using five Likert-style items (“Certain political goals are more important to me than upholding the democratic process”, and reverse-scored items, e.g., “Protecting the democratic process is more important than my particular group’s political
goals”). Response options ranged from 1 - **Strongly disagree** to 7 - **Strongly agree**. Given the partnership with local government in administering the surveys in Belgium, one item from the scale (“I would tolerate some level of unethical behavior in politicians who achieve political goals that are really important to me”) was considered inappropriate for this context and omitted in Studies 9D and 9E, resulting in a 4-item scale (9B: $\omega = .76$; 9C: $\omega = .77$; 9D: $\omega = .61$; 9E: $\omega = .65$).

**Violation of Democratic Norms**

Willingness to violate democratic norms was measured using the Democratic Norms Index (Broockman et al., 2021) which asks participants to evaluate a variety of specific instances of democratic norm violations that would give an unfair advantage to their political ingroup while suppressing the political agency of others. Items describe support for violating rights to free-speech (e.g. “[Outgroup] rallies should be banned”, gerrymandering (e.g. “When determining the boundaries for Congressional districts, [Ingroup] politicians should try to maximize the number of ingroup]s elected”, voter suppression (e.g. “Mail-in voting should be banned in areas that typically support [outgroup]”, and executive overreach ([Ingroup] elected officials should sometimes consider ignoring court decisions when the judges are appointed by [outgroup] presidents. Response options ranged from 1 - **Strongly disagree** to 5 - **Strongly agree**. $\omega = .70$.

**Behavioral Measures**

**In civility**

To measure support for aggressive behavior towards outgroups, participants were first provided with a short list of right-leaning and left-leaning groups (Republicans, Democrats, conservatives, liberals, Trump supporters, and social justice activists; In Study 9C, “social justice activists” was replaced with “progressives”) from which they could select the group with which they **identified most** and the group with which they **identified least**. They then rated an inventory of behaviors by a member of their ingroup that included various types of incivility or aggression (e.g., “Sending an anonymous threatening message to a [Democrat]”) or civility and cooperation (e.g., “Working together with a [Republican] to solve a shared problem”) towards members of their chosen outgroup. Participants rated these behaviors on a scale from 1 - **strongly oppose** to 4 - **strongly support**. The full inventory consisted of 22 items that described physical, social, epistemic, and economic forms of aggression and cooperation, with 14 incivility items and 8 reverse-coded civility items. Reliability in Study 9A: $\omega = .88$, Study 9C: $\omega = .94$.  

135
Political Behaviors Inventory

To assess political behavior, participants were presented with the following statement:

“Within the last three years, I have engaged in the following actions to attempt to achieve goals that are important to me and/or my community” and were asked to indicate (yes or no) the actions from a 21-item inventory in which they had recently engaged (See Figure 9.3 for all items). Destructive political activism was measured as the total count of destructive behaviors committed (“physical intimidation or violence” and/or “destroying property as demonstration”) to achieve political goals, for a possible score of 0, 1, or 2. General political engagement was measured by the total count of all other political behaviors selected (excluding destructive political behaviors). Possible scores for general engagement ranged from 0 to 19.

Political Identity and Ideology Measures

In the United States, political identity and ideology was operationalized in a variety of ways described below. Since data collection efforts in Belgium were sponsored by government agencies and in collaboration with local government partners, participants were not asked about their political party memberships or ideology directly. Instead, in Belgium political orientation was operationalized as one’s stance on a variety of specific political issues and movements.

Political Identity

Political identity was measured as a categorical variable that represented participants’ own selection of the political group with which they identify most (see incivility measure for response options). These categories were also combined into a two-level dichotomous factor, dichotomized political identity, which groups the identities according to their political orientation (simply “Right” and “Left”).

Political Ideology

To measure political ideology, participants were asked where they would place themselves on a spectrum from conservative to liberal, with response options ranging from 1- very liberal to 5 - very conservative.
**Strength of Political Ideology**

Political extremity, that is, the strength of one’s ideology without regard to the direction (right or left) of the ideology, was measured as the absolute value from the center response option (3 - moderate/neutral), which ranged from 0-2.

**Partisan Hate/Prejudice**

Partisan hate was measured using a six-item scale in which participants first select the political groups they identify with most and least (see categories in Incivility measure), and then rate agreement with statements about the basic moral character of their political ingroup and outgroup with the same statements repeated for both (e.g., “Republicans are basically bad people”, “Democrats are basically bad people”). Prejudice is calculated as the mean difference between these matched statement ratings such that higher scores represent greater discrepancies in their judgements of the outgroup compared to the ingroup. In other words, one who rates both Republicans and Democrats as both being very immoral or both being very moral would score low in partisan hate, whereas one who rated only their outgroup as very immoral while rating their ingroup as very moral would score high in partisan hate ($\omega = .88$).

**Political Orientation as Voting Behavior**

Political identity was also operationalized as vote choice by asking participants who voted in a recent election to select the candidate for whom they voted. In this way, left-leaning political orientation was operationalized as a vote for Clinton (2016) or Biden (2020) and right-leaning political orientation as a vote for Trump (2016 & 2020) and “other candidate” as a third category.

**Political Issues Orientation**

Political orientation was also measured as one’s position on various social issues operationalized as the strength of support for social movements considered to be left leaning/progressive (“Black Lives Matter”, “Me Too”, support for LGBTQ rights, and combating climate change). Participants were presented with the list of social movements and asked to rate the degree to which they support or oppose the movements rated on a scale from 1- Strongly oppose to 5 - Strongly support.
Studies 9A - 9E Results

Anti-Democratic Attitudes

Anti-Egalitarianism

In three studies comprising 821 US residents and 2852 Belgian residents, I found that a stronger zero-sum mindset predicted anti-egalitarianism and support for group-based dominance (social dominance orientation): Study 9A: $\beta = .37$, 95% CI [.33, .41], $p < .001$; Study 9D: $\beta = .43$, 95% CI [.38, .48], $p < .001$, Study 9E: $\beta = .40$, 95% CI [.35, .44], $p < .001$. Moreover, these effects remained robust when controlling for political identity and ideology (Figure 9.1) as well as other well-established predictors of social dominance orientation including sex, income, and ethnicity (9A: $\beta = .37$, 9D: $\beta = .44$, 9E: $\beta = .36$, all $p$s < .001). In other words, above and beyond the effect of one’s *own group status* based on sex, race, or income, or one’s particular political orientation, seeing social relationships as a zero-sum game predicted a stronger preference for a society in which some groups dominate others.
Figure 9.1

*Effect of Zero-Sum Mindset on Anti-Democratic Attitudes in the US and Belgium (N = 3,903)*

![Graph showing the effect of zero-sum mindset on anti-democratic attitudes in the US and Belgium](image)

**Note.** Estimates of the effect of zero-sum mindset on each kind of anti-democratic attitude are presented as standardized linear regression coefficients (\(\beta\)) when controlling for political identity/orientation. Estimates are presented in the rightmost column with 95% CIs in brackets as well as by square points and horizontal bars respectively.

**Disenfranchisement**

In four studies comprising 758 US residents and 2852 Belgian residents, I found that a stronger zero-sum mindset predicted lower commitment to voting rights and greater willingness to
disenfranchise others: Study 9B: $\beta = .30$, 95% CI[.17, .39], $p < .001$, Study 9C: $\beta = .31$, 95% CI[.23, .40], $p < .001$; Study 9D: $\beta = .37$, 95% CI[.32, .42], $p < .001$, Study 9E: $\beta = .39$, 95% CI[.34, .44], $p < .001$. These effects also remained robust when controlling for political identity and ideology (Figure 9.1) as well as when controlling for other demographic variables including sex, education, and ethnicity (9B: $\beta = .25$, 9C: $\beta = .31$, 9D: $\beta = .37$, 9E: $\beta = .36$, all $ps < .001$). In other words, above and beyond the effect of one’s own political party, identity or ideology, a zero-sum mindset predicts greater willingness to undermine the foundation of a healthy democracy—the right to vote.

**Willingness to Undermine the Democratic Process**

In four studies comprising 758 US residents and 2852 Belgian residents, I found that a stronger zero-sum mindset predicted greater willingness to compromise the integrity of the democratic process, using force rather than the democratic process in order to achieve political goals: Study 9B: $\beta = .40$, 95% CI[.30, .51], $p < .001$, Study 9C: $\beta = .38$, 95% CI[.29, .46], $p < .001$; Study 9D: $\beta = .45$, 95% CI[.40, .50], $p < .001$, Study 9E: $\beta = .39$, 95% CI[.34, .44], $p < .001$. And these effects remained robust when controlling for political identity and ideology (Figure 9.1) as well as when controlling for other demographic variables including sex, education, and ethnicity (9B: $\beta = .38$, 9C: $\beta = .39$, 9D: $\beta = .45$, 9E: $\beta = .37$, all $ps < .001$). That is, regardless of their political identity, people who see relationships as zero-sum are more likely to prefer force over fairness—violating a vital commitment to the “rules of the game” of democracy.

**Anti-Democratic Behaviors**

**Incivility**

In two studies comprising 1276 US residents, I found that stronger zero-sum mindset predicts support for more hostile and less civil behavior towards people with differing political persuasions: Study 9A: $\beta = .38$, 95% CI [.31, .44], $p < .001$, Study 9C: $\beta = .14$, 95% CI [05, .23], $p = .002$. When controlling for political orientation, this effect remained unchanged in Study 9A, and was slightly strengthened in Study 9C: $\beta = .18$, 95% CI [.09, .26], $p < .001$ (Figure 9.2). This effect was also little changed when controlling for demographic variables such as sex, ethnicity, and education (9A: $\beta = .33$, 9C: $\beta = .18$, $ps < .001$).

**Destructive Political Engagement**

In two studies comprising 2,362 Belgian residents, I found that stronger zero-sum mindsets predicted increased likelihood of participating in overtly destructive political behaviors (i.e., destroying property as demonstrations and/or using physical intimidation or violence in order to
achieve political goals) reported as incident rate ratios (IRR). Using a quasi-Poisson regression model, I found that for every unit increase in zero-sum mindset, one was 1.53 times more likely to have engaged in overtly destructive political behavior in Study 9D \((N = 1044)\), and 1.82 times more likely in Study 9E \((N = 1,318)\). When adjusting these estimates for political orientation (Figure 9.2) as well as other potential predictors of destructive forms of political behavior (political extremity, worse mental health, social isolation) I find that the effect remains (Study 9D: IRR = 1.50, \(p < .001\); Study 9A: IRR = 1.60, \(p = .02\)). Moreover, this effect was not a function of increased political engagement in general. When examining the relationship between zero-sum mindset and all other political behaviors, zero-sum mindset was unrelated to general political engagement in Study 9D \((\beta = .02, p = .46)\) and negatively related to political engagement in Study 9E \((\beta = -.14, p < .001)\). The relationship between zero-sum mindset and each individual political behavior across both samples when controlling for demographic and survey characteristics is presented in Figure 9.3.
Figure 9.2

Effect of Zero-Sum Mindset on Anti-Democratic Behavior (N = 3,903)

Note. Estimates of the effect of zero-sum mindset on each kind of anti-democratic attitude are presented as standardized linear regression coefficients ($\beta$) when controlling for political identity/orientation. Estimates are presented in the rightmost column with 95% CIs in brackets as well as by square points and horizontal bars respectively.
Figure 9.3

Effect of Zero-Sum Mindset on Political Behaviors in Belgium (N = 2,219)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Coefficient</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talking to friends and family about the issue</td>
<td>-0.47</td>
<td>[-0.59, -0.34]</td>
</tr>
<tr>
<td>Gave time to learning more about the issue</td>
<td>-0.28</td>
<td>[-0.40, -0.16]</td>
</tr>
<tr>
<td>Voted</td>
<td>-0.21</td>
<td>[-0.32, -0.10]</td>
</tr>
<tr>
<td>Promoted awareness on social media</td>
<td>-0.19</td>
<td>[-0.31, -0.07]</td>
</tr>
<tr>
<td>Attended protests</td>
<td>-0.12</td>
<td>[-0.25, 0.00]</td>
</tr>
<tr>
<td>Volunteered time to local needs</td>
<td>-0.08</td>
<td>[-0.20, 0.04]</td>
</tr>
<tr>
<td>Boycotted certain businesses</td>
<td>-0.07</td>
<td>[-0.18, 0.04]</td>
</tr>
<tr>
<td>Donated money to an organization working on these issues</td>
<td>-0.06</td>
<td>[-0.17, 0.05]</td>
</tr>
<tr>
<td>Talked to strangers about the issue</td>
<td>-0.04</td>
<td>[-0.15, 0.07]</td>
</tr>
<tr>
<td>Offered your particular skills to the cause</td>
<td>0.01</td>
<td>[-0.13, 0.14]</td>
</tr>
<tr>
<td>Attended public political meetings</td>
<td>0.03</td>
<td>[-0.12, 0.17]</td>
</tr>
<tr>
<td>Meeting with members of opposing groups to discuss differences</td>
<td>0.05</td>
<td>[-0.09, 0.20]</td>
</tr>
<tr>
<td>Joined a political party</td>
<td>0.05</td>
<td>[-0.12, 0.22]</td>
</tr>
<tr>
<td>Helped organize events or demonstrations</td>
<td>0.05</td>
<td>[-0.11, 0.21]</td>
</tr>
<tr>
<td>Started a petition</td>
<td>0.06</td>
<td>[-0.10, 0.22]</td>
</tr>
<tr>
<td>Contacted elected officials</td>
<td>0.10</td>
<td>[-0.03, 0.23]</td>
</tr>
<tr>
<td>Civil disobedience</td>
<td>0.13</td>
<td>[-0.03, 0.29]</td>
</tr>
<tr>
<td>Volunteered for a political campaign</td>
<td>0.20</td>
<td>[0.02, 0.37]</td>
</tr>
<tr>
<td>Joined an unofficial activist group</td>
<td>0.30</td>
<td>[0.13, 0.46]</td>
</tr>
<tr>
<td>Physical intimidation or violence</td>
<td>0.35</td>
<td>[0.08, 0.62]</td>
</tr>
<tr>
<td>Destroyed property as demonstration</td>
<td>0.77</td>
<td>[0.49, 1.05]</td>
</tr>
</tbody>
</table>

Note. Forest plot of logistic regression coefficients predicted from zero-sum mindset in all Belgian samples when controlling for age, education, income, acquiescent response style, and data collection method (N = 2,219).

Political identity, ideology, extremity, and partisan animosity were all measured in Study 9C, allowing for a more direct test of the effect of zero-sum mindset compared to a variety of operationalizations of social identity effects. To do this, I compared the amount of variance in anti-democratic attitudes and behaviors that can be explained by all available measures of social or political identity and partisan hate to the amount of variance explained by adding only zero-sum mindset to the model. I find that, over and above political identity and animosity, adding zero-sum mindset to the model significantly increased the amount of variance explained (all $\Delta R^2 ps <.001$) in all antidemocratic behaviors and attitudes measured, but nearly triple the variance explained for measures of commitment to the democratic process. Tables 9.1 - 9.3 display results of nested linear
regression models that include all measures of political orientation and partisan animosity (Models 1, 3 and 5) compared to models which add zero-sum mindset (Models 2, 4, and 6).
<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>Phi</th>
<th>95% CI</th>
</tr>
</thead>
</table>

**Model 1**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>Phi</th>
<th>95% CI</th>
</tr>
</thead>
</table>

**Model 2**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>Phi</th>
<th>95% CI</th>
</tr>
</thead>
</table>

Table 9.1: Predicted regression models predicting communalism to voting rights from partisanship and zero-sum mindset.
### Table 9.2

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>FL</th>
<th>95% CI</th>
<th>s</th>
<th>s^2</th>
<th>p</th>
<th>95% CI</th>
<th>(q)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predictor</td>
<td>Difference</td>
<td>R²</td>
<td>95% CI [CL]</td>
<td>t</td>
<td>DF</td>
<td>p</td>
<td>q</td>
<td>95% CI [CL]</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
<td>----</td>
<td>-------------</td>
<td>-----</td>
<td>----</td>
<td>-------</td>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>Zero-sum mindset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 6

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>R²</th>
<th>95% CI [CL]</th>
<th>t</th>
<th>DF</th>
<th>p</th>
<th>q</th>
<th>95% CI [CL]</th>
<th>t</th>
<th>DF</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 5

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Difference</th>
<th>R²</th>
<th>95% CI [CL]</th>
<th>t</th>
<th>DF</th>
<th>p</th>
<th>q</th>
<th>95% CI [CL]</th>
<th>t</th>
<th>DF</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9.3

Necessary regression models predicting interpersonal mobility from partisanship and zero-sum mindset.
Moreover, zero-sum mindset was the strongest predictor in all cases except Model 6, where partisan hate was a somewhat stronger predictor of interpersonal incivility toward political outgroups (Table 3). However, when predicting political attitudes, such as commitment to democratic process and voting rights, partisan hate was not a significant predictor, whereas zero-sum mindset more than doubled the variance explained by all other measures combined (Tables 9.1 - 9.3).

**Studies 9A - 9E Discussion**

Across five studies of 4,468 unique participants in the United States and Belgium, I found evidence that a zero-sum mindset predicts lower commitment to democratic principles. This effect was robust across a variety of measures of anti-democratic attitudes and behaviors situated within real political contexts. Importantly, the effect of zero-sum mindset on democratic principles and behaviors remained significant above and beyond the effect of political orientation across a variety of operationalizations, including: self-selected political identity (participants selected the political label they identified with most, Studies 9A - 9B), their stance on political issues (Studies 9D - 9E), general political ideology (measured on a continuum from very liberal to very conservative), and what is more, even when controlling for the extremity of one’s ideology (Studies 9B - 9C) and the strength of one’s contempt for their selected political outgroup (Study 9C).

This finding is particularly interesting in light of recent debates among political scientists about how much affective polarization, that is, the degree to which political groups dislike each other, actually bears political and not just interpersonal consequences (Druckman et al., 2021; Finkel et al., 2020). For example, Broockman et al. (2021) find that experimentally reducing affective polarization improved interpersonal attitudes between partisans, but it had no effect on commitment to democratic principles. While acknowledging that the potential effect of affective polarization on democratic principles may be indirect, operating over a longer time horizon than could be observed in the experiments, they also note that social scientists need to look beyond partisan animosity for explanations of democratic backslide:

There are a number of hypotheses for what is behind negative trends in democratic societies … In order to reverse these trends, researchers must build an understanding of which factors are contributing to these trends and which are not…in casting doubt on the role of affective polarization, our work underscores the need to attend to these other possibilities. (Broockman et al., 2021, p. 41)

While remaining cautious in the absence of experimental data, given the uniquely powerful effect of zero-sum mindset on commitment to democracy beyond measures of political identity and affective
polarization, future research may wish to consider the role of zero-sum beliefs in democratic erosion.

**Studies 9F - 9H: Voting**

In Studies 9A - 9E I found that a zero-sum mindset predicted weaker commitment to democratic principles over and above one’s particular political identity or strength of their ideology. In Studies 9F - 9H, I look more closely at the effect of a zero-sum mindset on arguably the most important of political behavior in a democracy: voting. First in Study 9F, I examine whether a zero-sum mindset predicts a lower likelihood of having voted within the past three years in Belgium, a country with exceptionally high voter turnout rates. Secondly, in Study 9G, I also tested this hypothesis in the United States, examining whether a zero-sum mindset predicts lower likelihood of having voted in the 2020 election. Finally, in Study 9H, I examine the effect of zero-sum mindset on objective broader voting behavior using voter turnout records from the 2020 US presidential election to examine whether zero-sum mindset (collected in advance of the election) predicted county-level voter turnout.

**Studies 9F - 9H Method**

**Participants and Procedure**

**Study 9F**

Study 9F utilized the same samples from Study 9D and Study 9E (Table A1, Samples 17 and 18).

**Study 9G**

One thousand and twenty-one US residents were recruited on Prolific using prescreens to recruit participants who did \( n = 578 \) and did not vote \( n = 443 \) in the 2020 Election, and among voters, an approximately even number of left-leaning and right-leaning voters \( n \) for Biden = 297; \( n \) for Trump = 264, \( n \) for other = 17). Seventy percent of participants identified as white, 10% as black/African American, 8% Latin/Hispanic, 5% as East Asian, 2% as South Asian, 1% as Indigenous/Native American, 1% as Middle Eastern, and 3% as other; 66% identified as female, 31% as male and 3% as non-binary/other. Ages ranged 18-80, \( M_{age} = 32.83, SD = 13.15 \). (Table A1, Sample 20).
Study 9H

US residents (N = 2,952) were recruited on Prolific with sampling targeted to approximately represent the US population in terms of political orientation, income, and education levels. Sixty-eight percent of participants identified as white, 10% as black/African American, 10% Latin/Hispanic, 9% as Asian, 1% as Indigenous/Native American, and 2% other; 45% identified as female, 54% as male and 1% as non-binary/other. Ages ranged 18-84, M_{age} = 32.88, SD = 11.21. (Table A1, Sample 13)

Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the 7-item scale assessing the general belief that life and success are like a zero-sum game described in Chapter 1. Likert-style responses were rated on a scale from 1 - Strongly disagree to 7 - Strongly agree.

Voting Behavior

In Belgium, voting behavior was included in the political behaviors inventory (see above) where participants selected, yes (1) or no (0), as to whether they have voted within the past three years. In the United States, participants were asked whether or not they had voted, yes (1) or no (0), in the 2020 presidential election.

Voting Intention

To measure intention to vote, participants were asked, “How likely are you to vote in the next election (2022 midterms)?” Response options ranged from 1- Extremely unlikely to 5 - Extremely likely.

Political Orientation/Identity

In the US, political identity was measured as a categorical variable that represented participants’ own selection of the political group with which they identify most (see incivility measure for response options). These categories were also combined into a two-level dichotomous factor, dichotomized political identity, which groups the identities according to their political orientation (simply “Right” and “Left”). In Belgium, political orientation was measured using the same scale of positions on various political issues used in earlier studies.
Strength of Political Group Identification

In the US, after participants indicated the political group with which they identified most, they were then asked, “How personally important is it to your identity to be considered a [ingroup]”? Response options ranged from 1- Not at all important to 5 - Extremely important.

County-Level Voter Turnout

Voter turnout was measured as the percentage of total votes cast within a US county divided by the total voting age population of that county. County-level population data was based on 2020 US Census data (U.S. Census Bureau, 2020) and voter turnout data was sourced from the MIT Election Data and Science Lab. Available from: electionlab.mit.edu.

County-Level Political Orientation

County-level political orientation was measured as the percentage of total votes cast for the Republican party candidate such that higher percentages represent more conservative counties and lower percentages represent more liberal counties.

Study 9F - 9H Results

9F: Self-Reported Voting Behavior in Belgium

To examine the effect of zero-sum mindset on voting behavior in Belgium, I used a logistic regression to predict whether participants voted within the past three years, dummy coded as either 1 (voted) or 0 (did not vote), reported as odds ratios (OR). I find that stronger zero-sum mindsets predict lower voter turnout in the nationwide survey (OR = .80, 95% CI [.70, .91], and in the city-wide survey in Belgium (OR = .72, 95% CI [.63, .83]). Moreover, this relationship remains significant when controlling for political orientation, and also when controlling for other demographic variables with well-established relationships to voter turnout such as age and education (1D: OR = .78, p = .001, 1E: OR = .80, p = 0.014).

9G: Self-Reported Voting Behavior in The United States

Replicating my analysis in Belgium, I also used a logistic regression to predict whether participants in the United States voted in the 2020 election, coded as either 1 (voted) or 0 (did not
vote), reported as odds ratios (OR). As predicted, I found that stronger zero-sum mindsets also predict lower voter turnout in the United States (OR = .76, 95% CI [.67, .86], \( p < .001 \)). Put differently, for every unit increase in a participant’s zero-sum mindset (measured on a scale from 1 to 7) the odds that they voted in the last election drops by 24%. Importantly, this relationship remains essentially unchanged when controlling for political orientation and the strength of one’s identification with their political group (OR = .75, 95% CI [.66, .85], \( p < .001 \)), and even when controlling for demographic variables with well-established relationships to voter turnout such as age and education (OR = .81, \( p = .003 \)).

Moreover, when asking participants how likely they would be to vote in the next election, I also found that a zero-sum mindset predicted a lower likelihood of prospective voting behavior (\( \beta = -.12, 95\% \text{ CI } [-.06, -.19], p < .001 \)) and this also when controlling for political orientation, age, and education (\( \beta = -.10, 95\% \text{ CI } [-.04, -.16], p = .001 \)).

9H: Objective Voter Turnout in the United States

To examine whether zero-sum mindset would predict lower voter turnout in the 2020 US election, I used a multiple linear regression to predict voter turnout (measured as total county-level vote divided by the total voting age population) from zero-sum mindset measures collected along with ZIP codes in a large, nationally representative sample of US residents several months before the election (\( N = 2,952 \)). I found that even when controlling for individual level variables (age, education, income, race, and political orientation) as well as county-level political orientation, county population, and geographic measures of latitude and longitude, zero-sum mindset predicts lower voter turnout (\( b = .0063, 95\% \text{ CI } [-.009, -.004], p < .001 \)). This means that a single unit increase on the zero-sum mindset predicts approximately a .63% reduction in voter turnout. While this number appears small, if applied to the voting age population of the United States (U.S. Census Bureau, 2020), this would represent approximately 1.6 million fewer votes nationwide.

The effect of zero-sum mindset on voter turnout is also significant (\( p = .003 \)) when I use a multilevel model (with state entered as a random effect and zero-sum mindset and control variables are entered as fixed effects) to help account for state-level differences in election laws.
Figure 9.4

Zero-Sum Mindset Predicting Voter Turnout in the 2020 US Presidential Election

Note. Gray shaded area = 95% confidence interval.

Studies 9F - 9H Discussion

In three studies comprising 6,191 unique participants (3,972 United States residents and 2,219 Belgian residents), I found that seeing life like a zero-sum game predicted lower participation in an essential democratic process: voting. To better understand the way in which a zero-sum mindset might suppress voting behavior, I also asked participants in Study 9G who did not vote to indicate why they did not vote. I found that a zero-sum mindset was not related to practical reasons for non-voting (e.g., “not enough time”), but rather to cynical reasons, such as a belief that “the system is rigged.” That the relationship between zero-sum mindset and voting behavior was also observed in Belgium, where voting is considered mandatory and barriers to voting are minimized, reduces the likelihood that those with a zero-sum mindset do not vote because they face greater barriers to voting than others. Rather, this suggests that when people in a society see their interests as fundamentally opposed rather than
intertwined, they lose faith in collective endeavors, such as elections, that are meant to serve collective interests. Of course, elections can only fulfill this purpose when the people in a society participate in them and trust their results. Therefore, such fatalism could ultimately become a self-fulfilling prophecy, where mistrust in the electoral system leads to lower participation and lower accountability for those that would, in fact, “rig the game” in their favor.

Study 9I: Partisan & Populist Zero-Sum Beliefs

In Studies 9F - 9H, I found that a generalized belief that success is zero-sum predicted lower voting behavior in both Belgium and in the United States. In one sense, this finding could be rather surprising. Since elections are the most salient zero-sum contest in politics, why would seeing success as zero-sum reduce people’s engagement in this ballot battle? We might think about a zero-sum mindset as a readiness to draw “us vs. them” lines between different people or groups in a society. However, which people or groups become organized into a zero-sum structure may direct the distrust and hostility towards different targets. In Study 9I, I examine the hypothesis that zero-sum mindset would predict specific zero-sum beliefs about different social cleavages in society—“partisan” cleavages and “populist” cleavages. However, I also predict that these specific zero-sum beliefs will relate to elections and voting behaviors in different ways. Partisan zero-sum beliefs, the belief that anything that hurts members of one political group harm the other, should direct the distrust and hostility that follows from a zero-sum belief primarily towards members of the opposite political party. Since partisan identity and goals operate largely within the political system, I predicted that partisan zero-sum beliefs would predict increased likelihood of voting, but also greater willingness to delegitimize the votes of political outgroups, and greater willingness to violate democratic norms that favor one’s political ingroup. In contrast, I predicted that populist zero-sum beliefs about the relationship between “the people” and “elites” would direct their distrust towards the entire political system. However, since one of the major candidates in the US 2020 presidential election was generally considered a populist candidate, it is unclear whether people with strong populist beliefs would be less likely to have voted in this particular election. Therefore, I also examine intentions to vote in the next election (midterm elections).

Study 9I Method

Participants and Procedure

Study 9I utilized the same sample as Study 9G.
Measures

Zero-Sum Mindset

Zero-sum mindset was measured using the same 7-item scale used in Studies 9B - 9H and described in Chapter 1.

Partisan Zero-Sum Beliefs

Participants were first provided with a short list of right-leaning and left-leaning political group descriptions from which they could select the group with which they identified most and the group with which they identified least. These identifiers were then inserted into a series of Likert-style items describing the relationship between the selected ingroup and outgroup members in zero-sum terms (example: “What is good for [liberals] means harm for [conservatives]”) and non-zero-sum terms (example: [Democrats] and [Republicans] have the same ultimate goals”). Response options ranged from 1 - Strongly disagree to 7 - Strongly agree (α = .86, ω = .86).

Populist Zero-Sum Beliefs

Populist zero-sum belief were measured using six Likert-style items (four positively keyed and two negatively keyed items) that described the relationship between “elites” and the “common man” as zero-sum, where gain for one must come at the expense of the other (e.g., “Elites in society benefit at the expense of regular people” and “Anything that helps people at the top usually hurts the rest of us”). Response options ranged from 1 - Strongly disagree to 7 - Strongly agree (α = .88, ω = .88).

People-Centrism

The “people-centric” attitude, considered an essential part of populism, was measured using the three-item Likert-style People-Centrism scale (Silva et al., 2020). Statements asserting the primacy of “the people” in governance (e.g., “The will of the people should be the highest principle in this country's politics”) and one reverse-key item: “) were rated on a scale from 1 - Strongly disagree to 5 - Strongly agree. Reliability, α = .60, ω = .57, consistent with levels typical for brief scales with reverse-key items (Soto & John, 2017).

Trust in Elections

Trust in elections was measured by asking participants to rate the extent to which they would trust the accuracy or fairness of the election process if they lived in a state governed by a member of
either political party for a total of 4 items (e.g., “If you lived in a state that was governed by a Republican/Democrat, how much would you trust the [fairness/accuracy] of the election process?” Response options ranged from 1 - None at all to 5 - A great deal. General trust in elections was calculated as the overall mean of all items. Partisan-biased trust in elections was measured as the mean difference between how much more a participant rated trust in elections (mean of fairness and accuracy rating) in a state governed by a member of their own political party compared to how much they would trust elections in a state governed by a member of the other political party. Fairness and accuracy ratings were highly correlated when evaluating trust within a party (r = .92, p <.001, Republican; r = .95, p <.001, Democrat). Trust ratings between parties were only modestly correlated (though still positive and significant, r = .20, p <.001).

Political Identity

Political identity was measured using the same items used in Study 9G.

Strength of Political Group Identification

Strength of political identity was measured using the same item used in Study 9G.

Study 9I Results

In Study 9I, I examined whether more specific zero-sum beliefs about social relationships might moderate the relationship between zero-sum mindset and willingness to violate democratic norms and voting behavior in the United States. As predicted, I found that zero-sum mindset predicted both partisan zero-sum beliefs (i.e. belief that whatever benefits members of one political persuasion must harm the other; r = .28 , 95% CI[.22, .33], p <.001) and populist zero-sum beliefs (i.e. belief that whatever benefits “those in charge” harms the “common man”; r = .26, 95% CI[.20, .31], p <.001), and these relationships were essentially unchanged when controlling for political identity (βs > .25, ps <.001), and were robust to controls for age, income, education, and sex (βs >.22, p <.001). While these specific zero-sum beliefs were also correlated with one another (r = .25, p <.001) they both retained significant relationships with zero-sum mindset when accounting for their shared variance (ps <.001) suggesting that one is not reducible to the other.

Both of these forms of zero-sum beliefs also predicted a willingness to violate democratic norms (partisan zero-sum beliefs: β = .34, p <.001, and populist zero-sum beliefs: β = .17, p <.001), and this also was robust when controlling for political identity and demographic variables (all ps <
That is, those who were more likely to see relationships between Americans of different political or class groups as zero-sum were more likely to condone disenfranchising their fellow citizens, banning the other side’s right to protest, and disregarding the rule of law when governed by political outgroups. However, these different zero-sum beliefs differed in meaningful ways when predicting voting behavior and trust in elections.

Table 9.4

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset</td>
<td>2.72</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Partisan Zero-Sum Beliefs</td>
<td>4.04</td>
<td>1.16</td>
<td>.28***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[0.22, 0.33]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Populist Zero-Sum Beliefs</td>
<td>4.86</td>
<td>1.26</td>
<td>.26***</td>
<td>.25***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[0.20, 0.31]</td>
<td>[0.20, 0.31]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. People-Centrism</td>
<td>6.01</td>
<td>0.86</td>
<td>-.18***</td>
<td></td>
<td>.03</td>
<td></td>
<td>.29***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[-.24, -.12]</td>
<td></td>
<td>[-.03, .09]</td>
<td></td>
<td>[.23, .34]</td>
</tr>
<tr>
<td>5. Democratic Norm Violation</td>
<td>2.46</td>
<td>0.68</td>
<td>.30***</td>
<td>.34***</td>
<td>.17***</td>
<td>-.15***</td>
<td></td>
</tr>
<tr>
<td>6. Intention to Vote</td>
<td>3.69</td>
<td>1.45</td>
<td>-.12***</td>
<td>.17***</td>
<td>-.01</td>
<td>.12***</td>
<td>-.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[-.18, -.06]</td>
<td>[.11, .23]</td>
<td>[-.07, .05]</td>
<td>[.06, .18]</td>
<td>[.07, .05]</td>
</tr>
</tbody>
</table>

Note. M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. * indicates p < .05. ** indicates p < .01. *** indicates p < .001.

Partisan Zero-Sum Beliefs

Unlike a general zero-sum mindset, partisan zero-sum beliefs predicted an increased likelihood of voting (OR = 1.15, 95% CI [1.04, 1.28], p < .001), such that including partisan zero-sum beliefs in the multivariate regression model actually strengthens the negative relationship between zero-sum mindset and voting behavior (OR = .70, 95% CI [.62, .80], p < .001). However, while partisan zero-sum beliefs predicted this greater likelihood of participating in this positive democratic behavior, this was also coupled with an increased likelihood of being willing to suppress the votes of members of the opposite political group, and greater partisan bias in which election results they would consider legitimate (partisan bias in trust in elections: β = .36, 95% CI [.30, .42]). Moreover, these effects were robust even when controlling for political orientation and the strength of one’s identification with their political group (β = .28, p < .001). In other words, the partisan expression of a
zero-sum mindset is more likely to leverage the political process when it favors one’s political ingroup but is also willing to use the political system in ways that undermine democratic principles. In a similar way, because the items in the democratic norm violation measure are framed primarily in terms of supporting partisan suppression of democratic accountability within the political system (e.g. “If a Republican governor can’t get cooperation from Democratic legislators to pass new laws, the Republican governor should issues executive orders on their own to accomplish their priorities”) it is unsurprising that when accounting for the shared variance among populist and partisan zero-sum beliefs, the relationship between partisan zero-sum beliefs and democratic norm violation is nearly three-fold that of populist zero-sum beliefs (β = .31 and β = .09 respectively).

**Populist Zero-Sum Beliefs**

Populist zero-sum beliefs, on the other hand, were not related to voting behavior (β = -.06, p = .26), except when controlling for the “people-centrism” component of populist attitudes, where zero-sum populist beliefs predicted a slightly lower likelihood of voting (β = -.14, p = .04).

Unlike partisan zero-sum beliefs, which predict trust in elections only when it favored the ingroup, populist zero-sum beliefs were more likely to predict lower trust in elections in general (β = -.18, p < .001). This negative relationship was slightly strengthened when controlling for political ingroup (β = -.22, p < .001) and demographic variables such as age, education, and income (β = -.19, p < .001). This attitude is in keeping with the general distrust in “the system” and the politicians who control it in either party.

Another important facet of populist sentiment is a focus on the concerns of “ordinary people.” While zero-sum populist beliefs were, as expected, also related to a “people-centric” attitude, it is important to note that zero-sum mindset was negatively related to the “people-centrism” component of populism (Table 4). And this facet of populism exhibited the opposite pattern from zero-sum populist beliefs, predicting lower willingness to violate democratic norms (Table 4) and stronger voting behavior (OR = 1.28, p < .001). In other words, this evidence suggests that it is not populism’s focus on “the concerns of ordinary people” that might make populist movements dangerous to democratic resilience. Rather, this suggests that it is the zero-sum construal of the relationship between “the people” and “elites,” however these may be defined, that predicts a willingness to undermine democratic principles.
Figures 9.4 – 9.6

The Effect of Different Zero-Sum Beliefs on Democratic Norms
Study 9J Discussion

When people see social relationships as a zero-sum game, they are more likely to apply the same zero-sum structure to more specific intergroup relationships within that society as well. While the patterns of zero-sum thinking (perceptions of hostility, lower trust, lower cooperation, greater drive for dominance) emerge whenever a zero-sum view is adopted, different manifestations of zero-sum mindset, that is, different groupings of society into a zero-sum configuration (i.e., specific zero-sum beliefs), may lead to different targets of distrust and hostility. When a zero-sum mindset is expressed in zero-sum populist beliefs, distrust and hostility are aimed at the whole political system, and democratic principles and participation in general is delegitimized. However, when a zero-sum mindset is expressed through partisan zero-sum beliefs, distrust and dominance are aimed primarily at members of the other political party. Therefore, only those democratic norms that run counter to partisan interests are delegitimized. However, in either expression, the political system is readily weaponized against fellow citizens when they are construed as an opponent in a zero-sum battle.

Study 9J: Global Democracy

In Studies 9A - 9I, I examined evidence in two democracies: The United States and Belgium. Despite their many differences, these countries are both relatively wealthy Western, industrialized, liberal democracies. To investigate whether the relationship between a zero-sum mindset and commitment to democracy might extend beyond a Western cultural context, I used a large, multi-national dataset that measures zero-sum beliefs about success in 42 different nations (Różycka-Tran, 2018) and two global indicators: the Democracy Index (Democracy Index 2018, The Economist Intelligence Unit) and the Risk of Political Violence Index (Credendo Group, 2018).

Study 9J Method

Participants

Study 9J utilizes data from The Belief in a Zero-Sum Game Project which collected responses from 11,363 participants at two timepoints in 42 countries (Różycka-Tran et al., 2015; Różycka-Tran et al., 2017)\(^1\) with at least one country from each continent. The participants were university students, \(M_{age} = 21.43, SD = 4.68\), 38% male, 60% female, 2% other/did not respond. Data available on the

\(^1\) The original dataset considers Puerto Rico a separate country from the United States. Country-level indicators of democracy and political violence are not separately available for Puerto Rico (considered a territory of the US). Therefore, data for Puerto Rico was not used for this analysis.
Measures

Zero-Sum Mindset

To measure general belief that life is like a zero-sum game Study 9J uses the same selection of five items (e.g., “Successes of some people are usually failures of others”) from the BSZG used to measure zero-sum mindset in Study 9A. These items were administered in 10 languages in 42 countries ($\alpha = .75$, $\omega = .77$).

Economic Zero-Sum Beliefs

To measure general economic zero-sum beliefs, I used the three-items from the original BZSG scale (See Chapter 1) that describe the economic domain (e.g., “The wealth of a few is acquired at the expense of many”) These items were also administered in 10 languages in 42 countries ($\omega = .79$).

Democracy Index

Country-level democratic flourishing was measured using the Economist’s Intelligence Unit’s Democracy Index, which rates democracy of each country on a 0 to 10 scale based on 60 indicators that represent The Democracy Index is based on five categories: electoral process and pluralism; civil liberties; the functioning of government; political participation; and political culture. Each category has a rating on a 0 to 10 scale, and the overall Index is the simple average of the five category indexes. Available from: https://www.eiu.com/.

Risk of Political Violence

Risk of political violence was measured using an indicator developed by Credendo Group. They define political violence as “all violent act(s) undertaken with a political objective.” Risk is based on the actual presence of political violence (internal and external) but also on the potential for conflict arising from “internal and external tensions, frustration and dissatisfaction.” Countries are classified on a scale from 1-low risk to 7-high risk. Available from: https://credendo.com/en/country-risk.

---

16 See Chapter 1 for original BZSG items and for more details on the CFA validating the separation of the BZSG into two separate scales.
Gross Domestic Product (GDP) Per Capita


Study 9J Results

In a simple linear regression predicting democratic flourishing from zero-sum mindset, I found a strong negative relationship ($\beta = -.44, p = .003$; Figure 7). This relationship, though reduced, remains significant when controlling for a well-established predictor of democratization—country level gross domestic product (GDP) per capita ($\beta = -.27, p = .04$). I also found the opposite relationship when examining risk of political violence, with stronger country-level zero-sum mindsets predicting increased risk of violence ($\beta = .48, p = .001$; Figure 8). This relationship also remains significant when controlling for GDP per capita ($\beta = .34, p = .01$).

Figure 9.7

Relationship between Democratic Index and Zero-Sum Mindset in 42 Nations
Figure 9.8

Relationship between Risk of Political Violence and Zero-Sum Mindset in 42 Nations

![Graph showing the relationship between Risk of Political Violence and Zero-Sum Mindset in 42 Nations. The graph includes points for various countries, such as Pakistan, Ukraine, Iran, Armenia, Georgia, Nepal, Brazil, Estonia, Russia, Indonesia, Honduras, South Korea, Vietnam, South Africa, Serbia, China, India, Japan, Philippines, Mexico, Latvia, Taiwan, Czechia, Bulgaria, Canada, Slovakia, Spain, Singapore, and others. The graph also includes a line indicating the trend.]

Table 9.5

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zero-Sum Mindset</td>
<td>3.67</td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Economic Zero-Sum Beliefs</td>
<td>3.76</td>
<td>0.35</td>
<td>.84***</td>
<td></td>
<td>.73, .91</td>
<td>.73, .91</td>
</tr>
<tr>
<td>3. Risk of Political Violence</td>
<td>2.50</td>
<td>1.60</td>
<td>.49***</td>
<td>.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Democracy Index</td>
<td>6.65</td>
<td>1.79</td>
<td>-.45**</td>
<td>-.25</td>
<td>-.69***</td>
<td>-.69***</td>
</tr>
<tr>
<td>5. GDP per capita</td>
<td>17461.39</td>
<td>16471.79</td>
<td>-.35*</td>
<td>-.14</td>
<td>-.54***</td>
<td>.59***</td>
</tr>
</tbody>
</table>

Note. M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$. 

163
Study 9J Discussion

Although this total dataset is very large ($N = 11,069$ participants), at the country-level ($n = 42$) this sample size is not adequately powered for the inclusion of comprehensive control variables. So, while this finding should be interpreted with caution, when considered alongside the rest of the evidence presented here, it suggests that the relationship between zero-sum mindset and democratic principles observed in the US and Belgium may also extend beyond the context of Western industrialized nations.

Note that this analysis differs from findings reported by Rózycka-Tran and colleagues (2015). This appears to be due to the differing conceptualizations of the BZSG, which emphasizes economic zero-sum beliefs (e.g., “The wealth of a few is earned at the expense of the many”) and zero-sum mindset, which measures only zero-sum beliefs about social relationships in general without particular domain-specificity. Previous research has found that zero-sum beliefs can push both for and against the maintenance of the inequality “status-quo” depending upon one’s ideological outlook (Davidai & Ongis, 2019). So, while one can be concerned about income inequality without seeing all wealth as a zero-sum game, zero-sum beliefs about economic inequality tend to be leveraged by those seeking to “level the playing field” while zero-sum beliefs about group-based status tend to be leveraged by those looking to maintain traditional social hierarchies. As demonstrated in Table 5, the relationship between economic zero-sum beliefs and indicators of democracy were noticeably weaker and not significantly correlated ($ps > .05$). In fact, concern about inequality (independent of its objective severity), a hallmark of democratic values, could galvanize democratic engagement. In Belgium (Study 9E), concern about income inequality predicted stronger political engagement ($\beta = .21, p < .001$) and stronger support for democratic principles ($\beta s > .11, p < .001$). Therefore, by separating out economic domain zero-sum beliefs, the relationship between commitment to democratic principles and the general belief that success is a zero-sum game becomes clear.

Chapter 9 Discussion

Across eight studies of more than 19,801 participants in 43 countries, I find robust evidence that the belief that success is like a zero-sum game predicts weaker commitment to democratic principles and lower participation in democratic processes such as voting, stronger anti-democratic attitudes and greater participation in violent or destructive anti-democratic behaviors.

Moreover, when comparing the effect of zero-sum mindset to the effect of political identity and affective polarization, I find compelling evidence that a zero-sum mindset is a better predictor of
anti-democratic attitudes and behaviors than one’s political identity, the strength of that identification, and even above the effect of one’s outright disdain for one’s political opponents. Granted, such social animosity may carry myriad other negative consequences, and may even have a role to play in strengthening our zero-sum beliefs. Future research may wish to examine the relationships between implicit game theories and affective polarization more closely. However, this evidence suggests that when we recognize the interdependence of our fates as fellow citizens, and perhaps the shared stake we all hold in the integrity of the democratic process, our commitment to this process may withstand even powerful partisan hate. However, when we view our relationship to one another as a zero-sum game, where in order for one person or group to win, the other must lose, political dominance becomes the superordinate goal, whether achieved through force or corruption.

Therefore, in our efforts to shore up the integrity of our democracies we must attend not only to matters of political identity or political interests, but also to the implicit beliefs people hold about the fundamental nature of the relationship between those identities and interests. To reforge our commitment to the social contract, we must regain our vision of the ultimate interdependence of our success.
General Discussion
Chapter 10

General Discussion

So, what kind of game is life? If a game is defined more by what can happen than what does happen, then the sheer possibility of growth through cooperation gives us reason to think that life may be a non-zero-sum game despite how often it is played as though zero-sum. But, as this research has demonstrated, positive-sum outcomes are unlikely to be realized when we believe we are playing a zero-sum game.

The recently burgeoning literature on zero-sum thinking demonstrates the myriad ways that specific zero-sum beliefs undermine social cohesion and solidarity, perpetuate violent conflicts and block progress towards justice and equality. The purpose of this research was to investigate whether the phenomenon of zero-sum thinking can be understood as a generalized mindset, with all of the cognitive, motivational, and behavioral consequences of zero-sum thinking across a wide variety of domains and situations.

In more than two dozen studies comprising more than 10,000 participants in six countries and five languages, I find robust evidence that a zero-sum mindset predicts perceptions, attitudes, and strategies consistent with playing a zero-sum game. More specifically, I find that zero-sum mindset predicts zero-sum beliefs about a variety of unrelated resources and relationships as zero-sum. Zero-sum mindset predicts general cognitive styles across cultures, and heightened perception of hostility in others across a variety of situations both explicitly and implicitly. Zero-sum mindset predicts diminished trust attitudes across a wide variety of trust domains as well as diminished behavioral trust in incentivized economic games. Perhaps most importantly, zero-sum mindset predicts lower cooperation even when cooperation could be a matter of life or death. Finally, I find that this stable, cross-situational, individual difference in zero-sum thinking ultimately undermines success for both individuals and societies, predicting lower economic growth, lower satisfaction with life, and lower commitment to democratic principles and participation.

On Causality, Stability and Malleability

One of the greatest challenges in studying a stable individual difference is the difficulty in inferring causality without being able to leverage simple experimental manipulations. When I set out to investigate the implicit belief that success is zero-sum, I was greatly motivated by potential for growth and increased solidarity that I believe follows from a non-zero-sum view of our relations to one another. However, I must admit I failed to anticipate that which in hindsight feels fairly obvious:
one’s core assumptions about the nature of success and relationships may not be readily altered. Indeed, to change such a basic belief about how the world works too frequently could feel disorienting and incoherent. Therefore, meaningful changes in zero-sum mindset may not come easily. While preliminary pilots of online interventions aimed to decrease zero-sum mindset have demonstrated only modest and largely non-significant results, such interventions have been relatively “light touch.” It remains to be seen whether more concerted efforts with different approaches or deeper engagement might be more fruitful. Just as what is observed does not determine what is possible, the observed stability of a zero-sum mindset does not imply its immutability. And, as we saw in Chapters 6 and 7, even small decreases in zero-sum mindset observed over time predict greater trust and willingness to cooperate. While this research utilized a host of methods to examine the relationship between zero-sum mindset and its hypothesized consequences, I hope that future research will take up the challenge of finding effective methods for reducing zero-sum mindsets. Such innovations would not only enable us to examine the effects of zero-sum mindsets experimentally, but they would also provide practical, actionable insights for communities looking to build the social cohesion necessary for collective action.

**On the Origins of Zero-Sum Mindset**

Given the consequences of a zero-sum mindset and the apparent difficulty in altering it, it will be important to understand its origins. How does the belief that life is zero-sum come to be? The most obvious and parsimonious answer to this question is that one’s beliefs about the world emerge from their experiences of the world. So, what kind of environments might we expect to give rise to a zero-sum mindset? Returning to the findings in Chapter 2, correlations with primal world beliefs might suggest that formative experiences of scarcity, hierarchy, competition, and stagnation could promote a zero-sum view of the world. In preliminary investigations using a large, representative sample of Americans, I find that one’s childhood economic environment (using participants’ childhood zip codes and objective economic indicators) weakly predicts zero-sum mindset, and that this small effect appeared to be largely driven by the most extremely resource-scarce environments. Relatedly, across the dozens of studies in which I have now examined the relationship between zero-sum mindset and income, I find mixed results. Most frequently, I find either no relationship or a very small negative relationship. Therefore, in future research, I hope to further examine the potential role of one’s social, rather than economic, environment in shaping zero-sum mindset.

---

17 Plans to conduct more in-depth field interventions in 2020 were interrupted by the COVID-19 pandemic. However, as demonstrated in Chapter 7, this global crisis also presented a real-world high stakes global situation in which to examine the effects of zero-sum mindset on cooperation.
Of course, as with any psychological phenomenon, we must not only consider one’s objective environment but also the individual differences that interact with environments to shape behavior, such as individual differences in cognitive style or personality. As evidenced in Chapter 4, zero-sum mindset reliably predicts a more rigid cognitive style. However, as previously discussed, this cognitive style may also help promote and maintain a zero-sum mindset. Future research should examine the relationship between cognitive processing styles and cognitive abilities and zero-sum mindset more closely.

Unlike cognitive style, which evidences stable patterns with zero-sum mindset across cultural contexts, the relationship between zero-sum mindset and personality is less straightforward, with stable patterns in the US but not in Pakistan or India. However, despite the variability and weak explanatory power of personality variables in these studies, zero-sum mindset demonstrated a remarkably stable ability to predict cognitive styles and social attitudes and strategies across cultural contexts. This may be due to the greater emphasis placed on one’s relational environment rather than internal traits for explaining behavior in non-Western cultures. As a science of human behavior, psychological science must take seriously cultural differences in the way behavior is best predicted across cultural varieties of human experience. Harnessing both the power of the situation and of stable, cross-situational differences, zero-sum mindset predicts perceptions and behaviors across a wide variety of domains and situations. More research is needed to investigate whether generalized beliefs about one’s social environment, such as a zero-sum mindset, can predict behavior across domains, situations, and cultural contexts better than personality traits. Yet, given the primacy of the situation and relationships in non-Western cultures, along with the evidence presented here, investigating individual differences in stable beliefs about how the world works may be a promising direction for future work that seeks to predict behaviors across situations and across cultures.

**Conclusions**

What people do to be successful in any given situation is fundamentally shaped by implicit assessments of the structure of success in that situation, in other words, what kind of game we think we are playing. Moreover, when people act as though the world were a zero-sum game characterized by fixed scarcity, hierarchy, and cut-throat competition, they also help bring about the reality they perceive. However, if we can learn to recognize and rethink such beliefs, we may also create a different world. Therefore, fostering the cooperation we need to be successful as individuals, groups, or societies, will require recognizing the ways in which our success is intertwined rather than opposed—linked, and not ranked.
Table A1

Overview of Data Collections and Power Analyses

<table>
<thead>
<tr>
<th>Sample</th>
<th>N</th>
<th>T</th>
<th>Year</th>
<th>Country</th>
<th>Language</th>
<th>Pre-Screen</th>
<th>Age M(SD)</th>
<th>Ethnic Composition</th>
<th>Gender Composition</th>
<th>Studies</th>
<th>Minimum Detectable Effect at 80% Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>821</td>
<td>T1</td>
<td>2018</td>
<td>US</td>
<td>English</td>
<td></td>
<td>34.54 (10.66)</td>
<td>70% White 13% Black 5% Asian 6% Latinx 6% Other</td>
<td>52% female 48% male</td>
<td>1.5</td>
<td>Study 1: d = .10 in a paired samples t-test See Note</td>
</tr>
<tr>
<td>2</td>
<td>353</td>
<td>T2</td>
<td>2019</td>
<td>US</td>
<td>English</td>
<td>Sample 1</td>
<td>36.96 (12.12)</td>
<td>72% White 10% Black 6% Asian 6% Latinx 6% Other</td>
<td>54% female 46% male</td>
<td>1.6,8</td>
<td>Studies 6 and 8: d = .30, f = .15, in multiple linear regression analyses with 1 predictor variable and 10 control variables</td>
</tr>
<tr>
<td>3</td>
<td>504</td>
<td>T1</td>
<td>2019</td>
<td>US</td>
<td>English</td>
<td></td>
<td>33.39 (11.07)</td>
<td>67% White 8% Black 7% Asian 8% Latinx 9% Other</td>
<td>56% female 44% male</td>
<td>1.6</td>
<td>Study 6: d = .24, f = .12, in multiple linear regression analyses with 1 predictor variable and 10 control variables</td>
</tr>
<tr>
<td>4</td>
<td>499</td>
<td></td>
<td>2019</td>
<td>US</td>
<td>English</td>
<td></td>
<td>33.67 (12.33)</td>
<td>66% White 7% Black/African American 9% Asian/South Asian 7% Latinx 1% Middle Eastern 5% Mixed 5% Other</td>
<td>54% female 42% male 4% other/non-binary</td>
<td>1,2,7</td>
<td>Studies 2 and 7: d = .25, f = .17 in a multiple linear regression with one predictor variable and 17 control variables</td>
</tr>
<tr>
<td>5</td>
<td>278</td>
<td></td>
<td>2019</td>
<td>Italy</td>
<td>Italian</td>
<td></td>
<td>42.01 (13.25)</td>
<td>Not collected</td>
<td>57% female 42% male 1% other/non-binary</td>
<td>1</td>
<td>See Note</td>
</tr>
<tr>
<td>6</td>
<td>506</td>
<td>T1</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td></td>
<td>40.05 (11.68)</td>
<td>69% White 13% Black 6% Asian 5% Latinx 5% Mixed 2% Other</td>
<td>45% female 55% male</td>
<td>3.4</td>
<td>Studies 3 and 4: d = .52, f = .16 in a multiple linear regression with one predictor variable and 10 control variables</td>
</tr>
<tr>
<td>7</td>
<td>305</td>
<td></td>
<td>2020</td>
<td>India</td>
<td>English</td>
<td></td>
<td>31.58 (7.69)</td>
<td>Not Collected</td>
<td>23% female 77% male</td>
<td>3.4</td>
<td>Studies 3 and 4: d = .52, f = .16 in a multiple linear regression with one predictor variable and 10 control variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8</td>
<td>352</td>
<td>T2</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Sample 3</td>
<td>34.88 (11.66)</td>
<td>69% White 7% Black 6% Asian 1% Native American 6% Other 7% Latinx</td>
<td>56% female 42% male 2% other/non-binary</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>335</td>
<td>T3</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Sample 3</td>
<td>35.47 (11.73)</td>
<td>69% White 6% Black 6% Asian 2% Native American 5% Other 6% Latinx</td>
<td>56% female 42% male 2% other/non-binary</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>370</td>
<td>Pakistan</td>
<td>2020</td>
<td>Urdu</td>
<td></td>
<td></td>
<td>29.45 (9.31)</td>
<td>Not Collected</td>
<td>34% female 66% male</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>599</td>
<td>2020</td>
<td>UK</td>
<td>English</td>
<td>Balanced for political orientation</td>
<td>37.89 (13.58)</td>
<td>89% White 2% Black 5% Asian 4% Other</td>
<td>56% female 44% male</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Balanced for Political Orientation</td>
<td>35.69 (13.07)</td>
<td>73% White 13% Asian 6% Latinx 6% Black 1% Native American 2% Other</td>
<td>50% female 49% male 1% other/non-binary</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2952</td>
<td>T1</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Representative in terms of income, education, and political orientation</td>
<td>32.88 (11.21)</td>
<td>66% White 10% Latinx 9% Asian 1% Native American 2% Other</td>
<td>45% female 54% male 1% other/non-binary</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>419</td>
<td>T2</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Sample 11</td>
<td>36.67 (12.75)</td>
<td>77% White 5% Black 6% Latinx 9% Asian 1% Native American 2% Other</td>
<td>58% female 42% male</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>265</td>
<td>T2</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Sample 6</td>
<td>41.05 (11.68)</td>
<td>77% White 7% Black 5% Latinx 9% Asian 2% Other</td>
<td>45% female 54% male 1% other/non-binary</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>455</td>
<td>2020</td>
<td>US</td>
<td>English</td>
<td>Balanced for Political Orientation</td>
<td>34.39 (12.98)</td>
<td>77% White 8% Asian 7% Black 5% Latinx &gt;1% Native American 2% Other</td>
<td>56% female 44% male</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>1523</td>
<td>2021</td>
<td>Belgium</td>
<td>French, Flemish, English</td>
<td>Primary Language: French, Dutch, Flemish, English</td>
<td>38.52 (14.76)</td>
<td>73% Belgian 11% Other European 4% North African 1% Sub-Saharan African 10% Other</td>
<td>40% female 59% male 1% other/non-binary</td>
<td>6.7, 8.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Study 7: $d = .19, OR = .71$ in a logistic regression where 80% of the total sample reported sheltering behavior.

Study 6: See Note on simulations of power for growth curve analyses.

Studies 3 and 4: $d = .29, f = .146$ in a multiple linear regression with one predictor variable and 10 control variables.

Study 6: $d = .22, f = .11$ in a multiple linear regression with one predictor variable and four control variables.

Study 9: $d = .32, f = .16$ in a multiple linear regression with one predictor variable and five control variables.

Study 9: $d = .10, f = .05$ in a multiple linear regression with one predictor variable and 10 control variables.

Study 6: $d = .27$ and $f = .14$, and in analyses of estimation conditions only ($N = 276$), powered to detect an effect as small as $d = .34, f = .17$.

Study 9: $d = .34, f = .172$ in a multiple linear regression with one predictor variable and five control variables.

Study 9: $d = .29, f = .146$ in a multiple linear regression with one predictor variable and five control variables.

Study 6: $d = .07$ in a multiple linear regression with 10 control variables; for participants with no missing data, $N = 762$, powered to detect an effect as small as $d = 2, f = .01$, in a multiple linear regression with...
one predictor and five control variables

Study 7: $d = .14, f = .07$ in a multiple linear regression with 10 control variables. For participants with no missing data, $N = 782$, powered to detect an effect as small as $d = .2, f = .01$, in a multiple linear regression with five control variables. For 897 participants who reported their vaccination status, this sample size is powered to detect an effect as small as $d = .10, OR = .83$, in a sample where 67% are already vaccinated

Study 8: $d = .14, f = .07$ in a multiple linear regression with 10 control variables. For participants with no missing data, $N = 782$, powered to detect an effect as small as $d = .2, f = .01$, in a multiple linear regression with one predictor and 10 control variables

Study 9: $d = .14, f = .07$ in a multiple linear regression with one predictor and 10 control variables. For participants with no missing data, $N = 782$, powered to detect an effect as small as $d = .2, f = .01$, in a multiple linear regression with one predictor and 10 control variables

Study 6: $d = .15, f = .08$ in a multiple linear regression with one predictor and 10 control variables. For participants with no missing data, $N = 1,171$, powered to detect an effect as small as $d = .16, f = .08$, in a multiple linear regression with one predictor and 10 control variables

Study 7: $N = 1,212$ with complete data on vaccination status, which is powered to
detect an effect as small as $d = .13$, OR $= .79$ in a logistic regression where 86% of the total sample who reported already being vaccinated.

**Study 8:** $d = .15$, $f = .08$ in a multiple linear regression with one predictor and 10 control variables. For participants with no missing data, $N = 1,171$, powered to detect an effect as small as $d = .16$, $f = .08$, in a multiple linear regression with one predictor and 10 control variables.

**Study 9:** $d = .15$, $f = .08$ in a multiple linear regression with one predictor and 10 control variables. For participants with complete destructive activism data, $N = 1,318$, this sample is powered to detect an effect as small as $d = .30$, OR $= 1.71$, in a logistic regression where 98% of the total sample reported zero destructive behaviors and 2% of the sample reported at least one destructive behavior.

---

<table>
<thead>
<tr>
<th>Study</th>
<th>$d$ or $f$</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 5:</td>
<td>$d = .23$</td>
<td>In an independent samples t-test, and an effect size as small as $d = .33$, and $f = .17$ in an ANOVA with a main effect and interaction effects.</td>
</tr>
<tr>
<td>Study 6:</td>
<td>$d = .10$, OR $= .84$</td>
<td>In a logistic regression where 43% of the total sample previously reported not voting in the 2020 election. $d = .16$, and $f = .09$ in multiple linear regression with one predictor and 10 control variables.</td>
</tr>
<tr>
<td>Study 7:</td>
<td>$d = .30$, $f = .15$</td>
<td>In an independent samples t-test.</td>
</tr>
<tr>
<td>Studies</td>
<td>Sample Size</td>
<td>Mean</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
<td>35.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14.12)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Samples with repeated measures are indicated by T (Timepoint) and Pre-Screen criteria. Across all studies, participants were only excluded from analysis if they failed to give consent to participate, failed attention or comprehension checks, were under age 18, or reported having already completed the study. No other exclusion criteria were applied. All sensitivity power analyses conducted at the $\alpha = .05$ threshold for 80% power. Study 1 Notes: For ICC estimates of retest reliability with two observations and an ICC greater than .6, a minimum sample size of 15 participants is required to achieve 80% power (Bujang and Baharum, 2017). For CFA analyses, Monte Carlo simulations indicate that samples larger than $N = 200$ may be considered adequate for analyses with two factors and at least three items for each factor (MacCallum, Widaman, Zhang, & Hong, 1999). Study 6 Note: In simulations of growth curve models with three Timepoints, a sample of 300 participants is powered (80%) to detect an effect size as small as $M_s = .2$ (Zhang & Wang, 2009).
All Sample Recruitment Methods & Participant Demographics

**Sample 1**
Eight hundred and twenty-one U.S. residents recruited using Amazon Mechanical Turk (MTurk) provided informed consent, passed attention checks, and completed the study. Seventy percent identified as white, 13% as black/African American, 5% Asian/South Asian, 6% Latin/Hispanic, and 6% other. Fifty-two percent identified as female, 48% as male; Ages ranged from 18 to 72, $M_{age} = 34.54$, $SD = 10.66$.

Pre-registration: https://osf.io/jbmn6

**Sample 2**
Sample 1 participants were invited to participate in this study nine months later. From the original 821 participants who completed this earlier study, 353 participants recruited on Amazon’s Mechanical Turk provided informed consent, and all passed attention checks to complete Study 1A. Among this sample, 72% identified as white, 10% as black, 6% as Latinx/Hispanic, 6% as Asian, 6% as other. Fifty-four percent identified as female, 56% male, and < 1% as other. Ages ranged from 18 to 72, $M_{age} = 36.96$, $SD = 12.12$.

Pre-registration: https://osf.io/qdjv7

**Sample 3**
Five hundred and four US residents recruited on the Prolific platform who gave informed consent and passed attention checks completed zero-sum mindset measures at Timepoint 1 in July of 2019. In this sample, 67% identified as white, 8% as Latinx/Hispanic, 7% as black/African American, 7% as Asian, 1% as Native American, 9% as other or preferred not to respond. Fifty-six percent of participants identified as female and 44% as male. Participant ages ranged 18-70, $M_{age} = 33.39$, $SD = 11.07$.

**Sample 4**
Four hundred and ninety-nine US residents recruited on the Prolific platform provided informed consent and completed the survey which required passing all attention checks. Sixty-six percent of participants identified as white/Caucasian, 7% as Latinx/Hispanic, 7% as East Asian, 7% as black/African American, 2% as South Asian, 1% as Middle Eastern, and 5% as mixed race, and 5% as other. Fifty-four percent of participants identified as female, 42% as male, and 4% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, $M_{age} = 33.67$, $SD = 12.33$.

Pre-registration: https://osf.io/rwgn5
Sample 5

Two-hundred and seventy-eight Italian residents were recruited to participate in an online survey. Recruitment efforts were conducted by local collaborators in the Reggio Emilia and Umbria regions as part of a project sponsored by the European Forum for Urban Security. Using a combination of paper and pencil and online survey methods, this sample was largely composed of municipality employees in law enforcement and immigration services. Forty-two percent identified as male, 57% as female, and <1% as other. Ages ranged from 18 to 88, $M_{age} = 42.01$, $SD = 13.25$.

Sample 6

Five-hundred and six US residents recruited on Amazon’s Mechanical Turk provided informed consent, passed attention checks, and completed the survey. Fifty-five percent identified as male, 45% as female. Sixty-nine percent identified as white/Caucasian, 13% as black/African American, 6% as Asian, 5% as Latinx/Hispanic, 5% as mixed ethnicity, and 2% as other. Ages ranged from 20 to 76. $M_{age} = 40.05$, $SD = 11.68$.

Sample 7

Three-hundred and five Indian residents recruited on Amazon’s Mechanical Turk gave informed consent, passed attention checks and two English language comprehension checks, and completed all measures. Seventy-seven percent of participants identified as male and 23% as female. Participant ages ranged from 20 to 68, $M_{age} = 31.58$, $SD = 7.69$.

Sample 8

All participants from Sample 3 (Timepoint 1) were invited to another survey in March of 2020 (Timepoint 2). From the original sample of 504, approximately 70% (352 participants) also participated in the survey at Timepoint 2. Among this sample, 69% identified as white, 7% as Latinx/Hispanic, 7% as black/African American, 6% as Asian, 1% as Native American, 6% as mixed race or other. Fifty-six percent identified as female, 42% male, and 2% as other/non-binary or chose not to respond. Ages ranged from 18 to 69, $M_{age} = 34.88$, $SD = 11.66$.

Sample 9

All participants from Sample 3 (Timepoint 1) were also invited to third survey (Timepoint 3) approximately two weeks after the Timepoint 2 survey in March 2020. From the original sample of 504, approximately 66% (335 participants) also participated in the survey at Timepoint 3. Among this sample, 69% identified as
white, 6% as Latinx/Hispanic, 6% as black/African American, 6% as Asian, 2% as Native American, 5% as mixed race or other. Fifty-six percent identified as female, 42% male, and 2% as other/non-binary or chose not to respond. Ages ranged from 18 to 69, $M_{age} = 35.47, SD = 11.73$.

**Sample 10**

Three-hundred and seventy Pakistani residents recruited using the Pollfish platform completed the survey, passing two attention checks. Survey instruments were translated into Urdu by a team of Pakistani psychologists fluent in English and Urdu, and backtranslated by another bilingual Pakistani academic to check for consistency with original scale item meaning. Sixty-six percent of participants identified as male and 34% as female. Participant ages ranged from 18 to 83, $M_{age} = 29.45, SD = 9.31$.

**Sample 11**

Five hundred and ninety-nine UK residents completed the study. Of the 599 participants, 534 (89%) identified as white, 30 (5%) as Asian/South Asian, 12 (2%) Black, and 23 (4%) as mixed race or other; Three hundred and thirty-four participants (56%) identified as female; Participants’ ages ranged 18-80 years old, $M_{age} = 37.89, SD = 13.58$). Participants were recruited using the Prolific platform. To help correct for the highly liberal skew in the Prolific participant population, recruitment targeted a more balanced representation of liberal and conservative participants using Prolific recruitment settings. The questionnaire was administered online and took about 5 minutes to complete. Participants who failed a simple attention check were asked to return their submission to Prolific and their data was not used for analysis. Participants who completed the survey received a code they could redeem for £0.67 on Prolific.

**Sample 12**

Three hundred US residents were recruited on the Prolific platform using pre-screening to recruit an even number of members of the major opposing political parties, 150 participants who identified as Republicans and 150 who identified as Democrats. Among these, 50% identified as female, 49% as male, < 1% as non-binary/other, and 73% as white, 13% as Asian, 6% as Latinx/Hispanic, 6% as black or African American, >1% as Indigenous/Native American, and 2% other. Ages ranged 18-76, $M_{age} = 34.69, SD = 13.07$.

**Sample 13**

US residents ($N = 2,952$) were recruited on Prolific with sampling targeted to approximately represent the US population in terms of political orientation, income, and education levels. Sixty-eight percent of participants identified as white, 10% as black/African American, 10% Latin/Hispanic, 9% as Asian, 1% as
Indigenous/Native American, and 2% other; 45% identified as female, 54% as male and 1% as non-binary/other. Ages ranged 18-84, $M_{age} = 32.88, SD = 11.21$.

**Sample 14**

Participants were recruited using the Prolific platform in two stages. First, a large representative sample of US residents was collected which measured baseline zero-sum mindset and demographic variables ($N = 2952$, Sample 12). Five days later participants from this sample were invited to participate. Four hundred and nineteen U.S. residents completed the study, of which 323 (77%) identified as white, 37 (9%) Asian/South Asian, 25 (6%) as Latinx/Hispanic, 21 (5%) as black/African American, 4 (1%) as Native American, and 9 (2%) as other or preferred not to respond; 58% female; Ages ranged 18-77, $M_{age} = 36.67$, $SD = 12.75$.

**Sample 15**

Two hundred and sixty-five participants recruited from Sample 6 ($N = 506$ completed the survey in January 2020) also completed the Timepoint 2 survey conducted during the week leading up to the November 4 US presidential election. Among these participants, 77% identified as white, 7% as black/African American, 5% as Latinx/Hispanic, 9% as Asian, 2% as other; 54% identified as male, 45% as female, and 1% as non-binary/other. Ages ranged from 2-77, $M_{age} = 41.05$, $SD = 11.68$.

**Sample 16**

Using pre-screening to recruit an even number of members of the major opposing political parties, 455 US residents recruited on Prolific completed the online study. Three hundred and fifty-one (77%) identified as white, 37 (8%) as Asian, 31 (7%) as black/African American, 23 (5%) as Latinx/Hispanic, 2 (>1%) as Indigenous/Native American, and 11 (2%) as other; 56% identified as female; Ages ranged 18-73, $M_{age} = 34.39$, $SD = 12.98$.

**Sample 17**

One thousand five hundred and twenty-three Belgian residents recruited using the online platform Pollfish completed the survey. Among this sample, 73% were Belgian with Belgian heritage, 6% were Belgian with other European heritage, 4% Belgian with North African heritage, 1% Belgian with Sub-Saharan African heritage, 7% Belgian with other heritage, for those who identified as non-Belgians, 5% were European heritage, < 1% African heritage, and 3% other heritage; 40% identified as female, 59% male, and < 1% as non-binary/other. All participants in this sample ($N = 1,523$) completed measures of zero-sum mindset and support for democratic principles. However, a smaller number of participants were randomly assigned to
complete a longer survey that included the full inventory of democratic behaviors and support for various social movements \((N = 1,040)\), resulting in different degrees of freedom for these analyses. Participants could take the survey in either French, Flemish or English. Ages ranged 18-74, \(M_{age} = 38.52, SD = 14.76\).

**Sample 18**

One thousand seven hundred and sixty-six residents of a major Belgian city\footnote{City officials requested that the city not be named} were recruited to the survey. Participants were recruited using a variety of methods to maximize survey uptake across the city, including mailing an invitation to participate to each physical address in the city, online advertising, flyers, social media promotions and cinema vouchers to incentivize participation. The survey default language was French, but participants could also take the survey in Flemish or English. Sixty-eight percent of participants completed the survey in French, 18% in Flemish, and 14% in English. Among this sample, 1387 participants also passed an “attention check.” Participants who did not pass the attention check but completed the survey still received a cinema voucher, but their data was excluded from analysis. In addition to this, we removed participants who reported having already taken the survey already for any reason which removed a further 11 participants leaving a sample of 1376 participants. Ten participants who reported age under 18 were excluded from the sample for a final sample of 1366 participants. Participants’ ages ranged from 18 to 96, \(M_{age} = 44.1\) years old, \(SD = 14.2\). Fifty-one percent of participants identified as Belgian with Belgian heritage, 5% as Belgian of other European heritage, 5% as Belgian with North African heritage, 1% as Belgian with Sub-Saharan African heritage, 2% as Belgian with other heritage, for those who identified as non-Belgian, 24% were European, 2% Latin American, 2% Asian, 1% Middle Eastern, 1% Sub-Saharan African, and 5% other. Approximately 54% identified as female, 45% as male and less than 1% as “other” or chose not to respond. Participants could choose not to answer certain questions or leave the survey at any time resulting in missing values for different measures. Varying degrees of freedom in various analyses are due to such missing values.

**Sample 19**

Five-hundred and ninety-three US residents recruited on the Prolific platform gave informed consent, passed an attention check, and completed the study. Seventy-four percent of participants identified as white/Caucasian, 9% as Latinx/Hispanic, 8% as East Asian, 8% as black/African American, 6% as South Asian, 1% as Middle Eastern, and 1% as other. Fifty percent of participants identified as female, 49% as male, and 1% as other/non-binary or chose not to respond. Participant ages ranged from 18 to 77, \(M_{age} = 37.93, SD = 14.28\).
Sample 20

One thousand and twenty-one US residents were recruited on Prolific using prescreens to recruit participants who did (n = 578) and did not vote (n = 443) in the 2020 Election, and among voters, an approximately even number of left-leaning and right-leaning voters (n for Biden = 297; n for Trump = 264, n for other = 17). Seventy percent of participants identified as white, 10% as black/African American, 8% Latin/Hispanic, 5% as East Asian, 2% as South Asian, 1% as Indigenous/Native American, 1% as Middle Eastern, and 3% as other; 66% identified as female, 31% as male and 3% as non-binary/other. Ages ranged 18-80, $M_{age} = 32.83$, $SD = 13.15$.

Sample 21

Three-hundred and forty-eight United Kingdom residents recruited on the Prolific platform gave informed consent and passed an attention check in Study 3D. Eighty-three percent of participants identified as white, 5% as South Asian, 5% as East Asian, 4% as black/African, 1% as Middle Eastern, and 2% as other. Ages ranged from 18 to 76, $M_{age} = 39.04$, $SD = 13.89$. Forty-nine percent identified as male, 50% as female and 1% as non-binary/other.

Sample 22

All participants who completed measures from Sample 18 were invited to participate in this study two weeks later. Seventy-two percent of participants identified as white, 10% as black/African American, 7% Latin/Hispanic, 5% as East Asian, 3% as South Asian, and 3% as other. Twenty-nine percent of participants identified as male, 69% as female, and 3% as non-binary/other. Ages ranged from 18 to 75, $M_{age} = 35.16$, $SD = 14.34$.

Existing Data Sample - Zero-Sum Beliefs in 42 Nations

Cross-country comparison analysis utilized data from The Belief in a Zero-Sum Game Project which collected responses from 11,363 participants at two timepoints in 42 countries (Różycka-Tran et al., 2015; Różycka-Tran et al., 2017)\(^{19}\) with at least one country from each continent. The participants were university students, $M_{age} = 21.43$, $SD = 4.68$, 38% male, 60% female, 2% other/did not respond. Data available on the

---

\(^{19}\) The original dataset considers Puerto Rico a separate country from the United States. Country-level indicators of democracy and political violence are not separately available for Puerto Rico (considered a territory of the US). Therefore, data for Puerto Rico was not used for this analysis.
Inter-university Consortium for Political and Social Research Repository:


General.


https://doi.org/10.1007/BF01448847

https://doi.org/10.1177/1745691611406922

https://doi.org/10.1371/journal.pone.0110938

www.oed.com/view/Entry/172003


https://doi.org/10.1016/j.jebo.2021.03.019

https://doi.org/10.1016/j.jrp.2012.10.004


https://doi.org/10.1007/s11205-012-0158-x


https://doi.org/10.1016/j.jrp.2017.02.004

https://doi.org/10.1002/ejsp.2674


https://doi.org/10.1111/j.1467-9868.2011.00771.x


https://doi.org/10.1371/journal.pone.0003985


The End.