"Your gain is my loss": An examination of zero-sum thinking with love in multi-partner romantic relationships and with grades in the university classroom

by

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ABSTRACT

"YOUR GAIN IS MY LOSS": AN EXAMINATION OF ZERO-SUM THINKING WITH LOVE IN MULTI-PARTNER ROMANTIC RELATIONSHIPS AND WITH GRADES IN THE UNIVERSITY CLASSROOM

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This thesis examines zero-sum thinking (ZST)—loosely defined as the perception that "your gain is my loss". First, I define the construct of ZST, and then identify its causes and roles. In contrast to previous work, I argue that scarcity beliefs are neither a sufficient nor a necessary condition for ZST. This is because: 1) even when resources are scarce, nonzero-sum interaction is possible, and 2) ZST might instead be caused by resource entitlement beliefs. I argue that ZST might serve two psychological roles: 1) as a cognitive heuristic it might have a causal influence on judgment, and 2) as a rationalization it might provide a moral justification for certain selfish or discriminatory behaviours. Finally, I use ZST to understand behaviour in two social contexts. First, although zero-sum thinking has been linked to prejudices against certain social groups, it has not been examined in the context of multi-partner romantic relationships. I hypothesize that some monogamists should have a tendency to interpret consensually nonmonogamous (CNM) relationships in zero-sum terms, and that this tendency should be associated with their prejudice against CNM relationships and individuals. Two studies provide support for this hypothesis. A third study investigates the hypothesis that ZST rationalizes the expression of anti-CNM prejudice, but does not find support. Second, curved grading is often lamented for creating what is assumed to be a competitive (or hostile) environment by virtue of the fact that it creates an artificial shortage of high grades, yet not all interactions in a curved classroom are zero-sum. I argue that the relative status of students is

a critical determinant of whether one student's gain would be a loss for another. Thus, I hypothesized that individuals would be least likely to cooperate with a peer when: 1) grades were curved, and 2) that peer's status was proximate to their own. Further, I hypothesized that when there was uncertainty about the interaction, individuals would behave as if it was zero-sum. Two studies provide support for these hypotheses. A third study investigates the Social Value Orientation trait to account for individual differences in ZST, but does not find support.

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Chapter 1

Zero-Sum Thinking: Where it Comes From and How it Operates

Zero-sum thinking (or rather, the minimization of zero-sum thinking) is believed to be of great importance to social and economic welfare. A columnist for Forbes called it "the source of most of human misery throughout the ages" (Karlgaard, 2006), and it has been argued that biological and cultural evolution are driven by the expression of ever deeper and richer forms *nonzero-sum* interaction (suggesting, of course, that zero-sum thinking would be a hindrance to such progress; Wright, 2001). Economists believe that zero-sum thinking can be a hindrance to economic progress (Krugman, 2003; P. H. Rubin, 2003), scholars of negotiation consider it to be a barrier to individuals finding mutually beneficial agreements (Bazerman, 1983; Thompson & Hastie, 1990), social scientists have identified zero-sum beliefs as a component of intergroup prejudices and conflict (Bobo & Hutchings, 1996; Esses et al., 2001; Ho et al., 2012), and zero-sum thinking has also been implicated in suboptimal decision-making (Meegan, 2010; Chernev, 2007). For these reasons, zero-sum thinking is an interesting and potentially useful psychological construct.

In the present chapter, I discuss previous work on zero-sum thinking, and then argue that there are two cognitive bases of zero-sum thinking and two psychological roles that zero-sum thinking might fill.

1.1   What is a Zero-Sum Situation?

In game theory, a situation is zero-sum when outcomes cancel each other out—when one party's gain is another's loss—and nonzero-sum when they do not (Von Neumann & Morgenstern, 1944). A zero-sum situation is "strictly competitive" (Rubinstein & Osborne, 1994), because a party cannot act in their own interest without acting against the interest of another. By contrast, nonzero-sum situations are either mutually beneficial (positive-sum), mutually destructive (negative-sum), or produce outcomes that are independent. Zero-sum and nonzero-sum situations are those in which individuals have opposing or common goals, respectively (Deutsch, 1949, 2006).

The availability of a resource may indicate a situation that has the potential for zero-sum interaction (though, as I argue later, scarcity is neither a necessary nor sufficient condition for zero-sumness). When a resource is plentiful, then no amount allocated to one party needs to come at the expense of another. But when a resource is limited, then any amount allocated to one party is that much less that can be allocated to others, and often the case is that some individuals will not have their needs or wants fully met. For example, in the portioning of a cake, any amount of the cake given to one person is that much less that can be portioned to another.

1.2   What is Zero-Sum Thinking?

Zero-sum thinking refers to the perception that a situation is zero-sum. When an individual engages in zero-sum thinking, they may infer gains from losses (or losses from gains) and perceive others as competitors for a mutually desired resource. Zero-sum thinking can and sometimes does occur independent of whether a situation is in fact strictly zero-sum. In this case, it is considered to be a perceptual or cognitive bias (Meegan, 2010). Zero-sum thinking is reflected by the phrase "your gain is my loss"; nonzero-sum thinking by the phrases "we're in this together", "win-win", or "no skin off my nose."

Zero-sum thinking is believed to be shaped by experience, and to vary at the societal and individual levels. For example, Foster (1965) observed that members of "peasant" societies had a tendency to view their world in zero-sum terms, and Różycka-Tran et al. (2015) similarly found that zero-sum beliefs are

more prevalent among members of societies with lower socio-economic standing. Zero-sum beliefs also vary between individuals within the same society (Bobo & Hutchings, 1996; de Dreu & Boles, 1998; Esses et al., 2001; Ho et al., 2012; Różycka-Tran et al., 2015), and appear to change as individuals learn more about the nonzero-sumness of a situation (Thompson & Hastie, 1990; Thompson & DeHarpport, 1994; Steinel et al., 2007).

In previous work, the nature of zero-sum thinking has been underspecified. Many have implicitly (Thompson & Hastie, 1990) or explicitly (Foster, 1965; Różycka-Tran et al., 2015) assumed that zero-sum thinking emerges from beliefs about, or perceptions of, resource scarcity. For example, in recent work, it has been proposed that zero-sum beliefs reflect a general belief system about the nature of social relations as antagonistic, and that these beliefs are based on the implicit assumption of scarce resources (Różycka-Tran et al., 2015). In contrast to this, I would argue that zero-sum thinking may stem not only from beliefs about resource scarcity, but also from beliefs about resource entitlements. In the sections below, I outline the general argument that each of these beliefs might serve as a basis for zero-sum thinking.

Zero-sum thinking has also been defined as a cognitive heuristic (Bazerman, 1983; Chernev, 2007; Meegan, 2010)—which is to say that it operates to influence perception and judgment below an individual's conscious awareness. However, little attention has been given to the other roles that zero-sum thinking might play in social behavior. In the sections below, I make the argument for how zero-sum thinking might play the role of a rationalization: a moral justification for socially undesirable behavior.

1.3   Two Bases of Zero-Sum Thinking

Różycka-Tran et al. (2015) and others (Foster, 1965) have implicitly or explicitly assumed that zero-sum thinking emerges from beliefs about resource scarcity. I propose that beliefs about resource entitlement (i.e., beliefs about how resources should be allocated) may also serve as a basis for zero-sum thinking. In the sections below, I discuss each of these beliefs and their role in zero-sum thinking.

1.3.1 Scarcity Beliefs

Zero-sum thinking can result from the belief that resources are limited. Individuals who perceive that a resource is scarce should be expected to engage in zero-sum thinking because scarcity logically implies that there is not enough of the resource to meet everyone's needs or desires. Scarcity-based zero-sum thinking has been observed in the context of negotiations (Bazerman, 1983; Carnevale & Pruitt, 1992; Thompson & Hastie, 1990) and folk economics (Baron & Kemp, 2004; P. H. Rubin, 2003; Walker, 2007) where there is often assumed to be a "fixed pie" of resources.

However, while scarcity beliefs may be one of the necessary conditions for zero-sum thinking, I would argue that it is not a sufficient one. This is because while scarcity promotes zero-sum interaction, it does not guarantee it. This is most clear in the case of status competitions, where individuals might receive resources according to where they stand in a social hierarchy. For example, in many sports competitions players are ranked based on how their performance compares to the performances of their peers, and resources are typically given only to a small number of high-ranking players (e.g., the top-3). These situations are often described as zero-sum, but rank changes are zero-sum only under certain conditions. For example, when the player in rank 2 moves up, the player in rank 1 also moves down. But it is not the case that all players are in a zero-sum relationship with all other players. For example, when the player in rank 10 moves up to rank 5, this movement only affects the players who previously occupied ranks 5 to 9; it has no effect on the players who occupy the ranks below 10 or above 5. Thus, in a status competition, status-proximity is also a necessary condition for zero-sum interaction. This is important because it highlights the possibilities for individuals to cooperate with their peers for mutual benefit in a situation that might ordinarily be considered to be zero-sum. I will return to this argument in Chapter 3 when examining one of these status competitions.

1.3.2 Entitlement Beliefs

A resource entitlement belief (hereafter "entitlement belief") is a belief about how a resource should be distributed, that is, the amount that parties deserve to receive from its allocation. At the extreme is what Blumer (1958) called a

"proprietary claim"—the belief that one has the exclusive right to, or sole proprietorship of, a resource. Less extreme entitlement beliefs include the belief that one is entitled to the "lion's share" of a resource, or simply entitled to more resources than others. Entitlement itself has been defined elsewhere as a psychological trait reflecting "a stable and pervasive sense that one deserves more and is entitled to more than others" (Campbell et al., 2004).

I suggest that an entitlement belief acts as a reference point (Kahneman, 1992) that imbues a resource allocation with meaning, and in some cases generates zero-sum thinking. This is most clear in the case of a proprietary claim. An individual who believes that they have the exclusive right to a resource will use the total amount as a reference point. Consequently, they will interpret any amount less than the total amount as a loss, and will perceive that the gains of others who were not also entitled (as they might be in the case of group entitlements) were at expense of their own proprietary claim. Regardless of whether the resource is scarce or fixed in quantity, the proprietary claim transforms the allocation of a resource into a zero-sum situation.

Non-proprietary entitlement beliefs can generate zero-sum thinking in the case of fixed-quantity resources. As an illustration, consider the cake example described earlier. The cake exists as a fixed quantity, but there is only a zero-sum trade-off in its distribution if it exists in a quantity that cannot satisfy the entitlements of all cake-eaters. Let's say there are two cake-eaters, and one of them believes they are entitled to three-quarters of the cake. If the second cake-eater believes they are entitled to one-quarter of the cake, then there is no conflict between the two cake-eaters because both can receive the quantity that they feel entitled to. But if the second cake-eater believes they are entitled to half of the cake then there is a zero-sum conflict of interests. If the second cake-eater is given half of the cake, then the first cake-eater may perceive that the second cake-eater has gained at their expense.

Proprietary-based zero-sum thinking can be seen in the Israel-Palestine conflict where proprietary land entitlements to Jerusalem are a great source of tension Maoz & McCauley (2005, 2009), as well as in the debate over intellectual property "theft" and the "pirating" of digital goods, where the music, movie, and software industries appear to have adopted a zero-sum interpretation (e.g., one report assumed a "direct dollar for dollar correlation between piracy and proprietary software spending"; Geist, 2010), while many consumers have adopted a nonzero-sum interpretation (Loughlan, 2008; Shields, 2009). As I argue in

Chapter 2, entitlement beliefs are also likely to play a role in zero-sum thinking about relationship resources.

1.4   Zero-Sum Thinking as a Heuristic

Although zero-sum thinking might occur through a reasoned process of judgment, the kind of zero-sum thinking that I am interested in is intuitive. By "intuitive," I am referring to a cognitive process that is fast, automatic, effortless, and mostly operating without a person's conscious awareness of the process having taken place. In previous work, intuitive zero-sum thinking has been conceptualized as a cognitive heuristic, which is a basic type of intuitive cognitive process.

Heuristics have been conceptualized in various ways. Newell & Simon (1963, p. 390) defined a heuristic as input to a decision that was "not 'guaranteed'" to determine the result, that was generated by a "rule of thumb," and whose purpose was to solve problems for which there were no other known ways of generating a solution. Tversky & Kahneman (1974) imagined heuristic judgments as being analogous to subjective judgments of physical quantities, like distance and size, in which the unknown properties of one object were judged based on the known properties of another object. Kahneman & Frederick (2002, 2005) defined a heuristic by the substitution of cognitions: like when an individual is asked a difficult question, and responds by substituting an answer to an easier one. A defining feature of heuristics is therefore that they are employed in making decisions under uncertainty.

Presently, I conceptualize a "zero-sum heuristic" as a cognitive process that facilitates judgment about complex or uncertain resource allocations, which leads to the judgment that one party's gain is another party's loss (or vice-versa). When an individual perceives that some parties have gained from a resource, a zero-sum heuristic should lead them to intuitively judge that one party's resource gain will diminish the ability for other parties to also gain resources. There are several examples of a zero-sum heuristic documented in the literature (Chernev, 2007; de Dreu & Boles, 1998; Meegan, 2010).

1.5 Zero-Sum Thinking as a Rationalization

Another role that zero-sum thinking could serve is to rationalize an individual's behavior. A rationalization is an explanation that an individual provides for their behavior, which may not reflect their true intentions, motivations, or reasons for engaging in the behavior. Rationalizations are believed to serve a reputation defense function (Trivers, 2000; Emler, 1990). For example, Trivers (2000, p. 118) states that rationalizations are a product of "self-serving social theories and biased internal narratives of ongoing behavior which hide true intention" and can be summoned immediately "should we be challenged by others", and that such deception is valuable because it allows an individual to present themselves at all times as an "altruist and a person beneffective in the lives of others". Similarly, Emler (1990, p. 183) suggests that "the basic means available for reputation management are the public choices an individual makes and the accounts, explanations and justifications he or she gives for those choices". In other words, rationalizations protect individuals from the reputational damage that a socially undesirable behavior might inflict, by enabling them to frame their behavior in a way that appears reasonable or acceptable to others.

An interesting corollary is that the *availability* of a rationalization should be expected to increase the likelihood that an individual will engage in certain socially undesirable behaviors. Indeed, Crandall & Eshleman (2003, p. 432) argue that the cognitive accessibility of rationalizations "serve the function of releasing prejudice" because they permit public (and private) acceptance of the behavior. In outlining their *justification-suppression hypothesis*, they argue that individuals are motivated to both express their negative feelings towards groups or individual members of groups, and to control their expression of such feelings out of concern for their reputation.

Along these lines, I would argue that zero-sum thinking might provide a moral justification for selfish or discriminatory behavior. This line of reasoning would be consistent with the "legitimizing myths" described by Social Dominance Theory (Pratto et al., 1994), an indeed some zero-sum beliefs appear to be associated with the Social Dominance Orientation trait (Ho et al., 2012). In Chapter 2 I will explore this rationalization process as it relates to the expression of consensual nonmonogamy prejudice.

1.6 Summary

In this chapter, I discussed previous work on zero-sum thinking, which refers to the perception that one party's gain is another party's loss. In previous work, zero-sum thinking has been implicitly (Thompson & Hastie, 1990) or explicitly (Foster, 1965; Różycka-Tran et al., 2015) assumed to emerge from beliefs about resource scarcity. I argued that scarcity beliefs are neither necessary nor sufficient for zero-sum thinking to occur. First, they are not sufficient because even when a resource is scarce, it is not the case that one person's gain is another's loss (e.g., in status competitions). Second, I argued that zero-sum thinking might also stem from beliefs about resource entitlements. For example, an individual who feels entitled to the entire share of a resource should perceive another's gain to be their own loss because it deprives them of the amount to which they feel entitled.

Finally, I discussed two psychological roles that zero-sum thinking might fill. The first is that of a heuristic—an intuitive cognitive process that influences judgment quickly, automatically, and without effort or conscious awareness of the process having taken place. The second is that of a rationalization—a moral justification that allows individuals to engage in selfish or discriminatory behavior without social sanctioning.

In the remaining chapters of my thesis, I will investigate zero-sum thinking in two different social contexts, returning to the arguments and ideas presented in this chapter. The first context that I will investigate is romantic relationships, where I explore the association between zero-sum thinking and prejudice against consensual nonmonogamists. The second context is the university classroom, where I explore zero-sum thinking as a determinant of the competitive behavior that occurs between students for grades.

Chapter 2

Zero-Sum Thinking Promotes Consensual Nonmonogamy Prejudice

Consensual nonmonogamy (CNM) is defined as a relationship in which parties agree that is permissible or desirable to have romantic or sexual relationships with others. It includes, but is not limited to, relationships that are "open", swinging, and polyamory. In this chapter, we[1] propose that one of the bases of anti-CNM prejudice is zero-sum thinking, loosely defined in this context as the perception that one person's love gained is another's love lost. We argue that zero-sum thinking derives from underlying beliefs about relationship resources—that they are scarce (scarcity beliefs), and/or that parties to a relationship deserve all of their partner's relationship resources (entitlement beliefs). Further, we argue that zero-sum thinking might cause anti-CNM prejudice, or it might serve to rationalize the expression of anti-CNM prejudice. That is to say, individuals might engage in zero-sum thinking when interpreting CNM relationships, and thus perceive CNM relationships and the parties to them as unhealthy or immoral; or alternatively, individuals might be biased against CNM relationships, and a zero-sum rationalization provides them with the opportunity to express their prejudice without social repercussions.

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[1]Throughout this chapter, I use the plural "we" in recognition of a collaborator, Alicia Rubel, who has contributed to the development of ideas and experiments presented.

2.1 Monogamous and CNM Relationships

In Western societies, monogamy is the most prevalent type of romantic relationship. One indicator of monogamy's prevalence is the number of sexual partners an individual reports having had within a 12-month period, from which Greeley et al. (1990) estimated that 82% of Americans practice monogamy. A smaller percentage of individuals engage in nonmonogamy: using data from the 1991 General Social Survey, Greeley (1994) estimated that 15% of married individuals have had sex with someone other than their spouse. However, only some of these individuals are practicing nonmonogamy with the consent of their partner. An estimated 4 to 5% of individuals practice or desire CNM at any given time (Conley et al., 2012; J. D. Rubin et al., 2014), and an estimated 20% of individuals in the United States have engaged in CNM at some point in their lives (Haupert et al., in press).

Subtypes of CNM differ in the emphasis that is placed on emotional versus sexual intimacy (Matsick et al., 2014), with swinging on the one hand placing a strong emphasis on sexual encounters with others outside of a primary relationship, and polyamory on the other hand placing a strong emphasis on multiple loving or romantic partnerships. Open relationships appear to be more generic and open-ended, permitting relationships of a sexual and/or romantic nature (Easton & Hardy 2009; Taormino 2008; but see Matsick et al. 2014). The present research is situated within the context of CNM relationships that involve multiple loving partnerships, not solely those of a sexual nature, and as such we believe that it is most relevant to polyamorous and open relationships.

2.2 Relationships as Economies of Love

Central to our argument is the premise that individuals construe the activities that go on within romantic relationships in terms of a conceptual metaphor (Landau et al., 2010) that maps the domain of relationships onto the domain of economics. Further, we argue that the two bases for zero-sum thinking described earlier (scarcity or entitlement beliefs) exist and operate to generate zero-sum thinking about romantic relationships.

First, individuals' everyday experiences with scarce material resources in other domains may transfer to their understanding of abstract, romantic relationship resources like romantic love. Some individuals might believe that these resources exist in a fixed quantity, like a pie, and thus the pool of resources would be strained or depleted if an individual were to have multiple romantic partners to whom these resources would be given. Along similar lines, Easton & Hardy (2009) described a "starvation economy" as the belief that relationship resources like love are scarce, and they also suggested that this belief derives from past experiences.

Second, when two individuals agree to be monogamous, they are typically agreeing to reserve certain behaviours (like physical intimacy) and emotions (like romantic love) for one other. Some individuals might believe that this exclusivity means they are entitled to all of the time, attention, love, and intimacy that their partner has to give. Or, from the perspective of the giver, there might be an expectation or desire for their partner to receive all of the relationship resources that they have to give (this might be viewed as demonstrating to ones partner that they are special / unique). In turn, this entitlement belief may lead individuals to perceive that the love spent on someone else represent a loss.

2.3   Evidence of Anti-CNM Prejudice

Individuals who practice CNM are frequently victims of prejudice and discrimination. In 2000, Nearing commissioned a survey of 1000 polyamorous individuals that asked how much prejudice or discrimination they had witnessed against polyamorous individuals, and 47% answered "a lot." In 2012, Fleckenstein et al. surveyed 4000 polyamorous individuals that asked whether they had, within the past 10 years, personally experienced discrimination for being polyamorous, and 26% answered that they had.

CNM individuals face discrimination in many situations, such as in the workplace, in custody cases, in housing, and from laws that prescribe monogamy (Emens, 2004; Lesher, 2013). Keener (2004) outlined a taxonomy of different forms of prejudices directed at polyamorous individuals. The major themes were 1) mainstream prejudice, which refers to prejudice involving institutions or common social interactions; 2) personal prejudice, which refers to prejudice

experienced by polyamorous individuals in their personal interactions or relationships; and 3) internalized prejudice, which refers to social conditioning to monogamous culture that results in an inner struggle between past (monogamous) beliefs and present (consensually nonmonogamous) behavior. A salient example of institutional discrimination is illustrated by a 1999 custody case in which a woman lost custody of her three-year-old child because she was having consensual sex with two men. The judge said this about the court's decision: "parents can't do that. Parents have to set the correct examples for the kids. And part of the statute says that you have to be concerned with the moral upbringing of the child.... I am not about to put that child back into a situation where all three of these people are in the same bed" (Emens, 2004). Another example is the denial of third-guardianship, which would prevent a CNM parent from visiting their child in a hospital or having authority to release them from medical care (Keener, 2004).

In previous research, CNM individuals and their relationships have been found to be generally viewed in a negative light. For example, Conley et al. (2012, 2013) asked individuals to rate the extent to which monogamous or CNM individuals possessed desirable traits, such as being caring, warm, charismatic, or law-abiding. Compared to monogamy, CNM was rated more negatively; even on relationship quality dimensions when the characters were described as being happy with their arrangement. Similarly, Grunt-Mejer & Campbell (2016) asked individuals to evaluate monogamy, cheating, and three types of CNM relationships. They found that while the CNM relationships were evaluated more positively than cheating, they were evaluated more negatively than monogamy on satisfaction and morality; again, despite the fact that the CNM characters were stated to have consented to the relationship and were described as being satisfied. Burris (2014) also found that individuals negatively judged a hypothetical polyamorous individual on a number of different evaluative dimensions, and also rated this individual as negatively as one in a "love affair" or "sexual fling" scenario. They used a perspective taking intervention, but found that it did not improve judgments of the polyamorous individual, suggesting that the average individual may have a difficult time understanding and therefore empathizing with a consensual nonmonogamist. Keener (2004) also describes cases where individuals have lost friendships for being polyamorous, and cases where polyamory was used as a scapegoat for problems in their relationship.

In the media, CNM is frequently portrayed in a negative light. Conservative pundits often use CNM relationships as part of "slippery slope" arguments

about social disorder, and other media sources commonly portray CNM relationships as titillating and morally questionable, perhaps because they play into real concerns about infidelity (Antalffy, 2011). Similarly, nonmonogamy in fiction is frequently used as a source of narrative tension that ultimately resolves into monogamy, with few works exploring nonmonogamy as an ethical choice (Saxey, 2010).

2.4 Does Zero-Sum Thinking Cause or Rationalize CNM Prejudice?

Why do some monogamists devalue CNM relationships and derogate those who participate in them? Here we consider the possibilities that zero-sum thinking: 1) causes feelings of anti-CNM prejudice, and 2) rationalizes the expression of anti-CNM prejudice.

2.4.1 Zero-sum thinking causes anti-CNM prejudice

We argue that zero-sum thinking might originate from scarcity or entitlement beliefs and cause anti-CNM prejudice. Some monogamists might believe that relationship resources, like love, are scarce. This point has often been made in discussions where monogamy and CNM are contrasted; in these discussions, the scarcity vs. abundance of love is a common theme (Anapol, 2010; Broussard, 2013; Easton & Hardy, 2009; Klesse, 2011; Newitz, 2006; Overall, 1998; Swan, 2013). For example, in "The Ethical Slut," Easton & Hardy (2009, Chapter 9, Section 1, para. 1) argued:

> "Many people believe, explicitly or implicitly, that romantic love, intimacy and connection are finite capabilities of which there is never enough to go around, and that if you give some to one person, you must be taking some away from another."

Alternatively, if an individual believes that their partner should be exclusive to them, then they may, for that reason, interpret their partner's investment in someone else as a loss to themselves. Consequently, this understanding of relationship

entitlements might cause them to believe that parties to CNM relationships are getting less love than they could, and deserve, to receive.

Thus, we suggest that zero-sum thinking might cause some monogamists to perceive an inequity or inadequacy in a CNM relationship, and consequently to experience negative feelings towards CNM individuals.[2] Indeed, when monogamists speak negatively of CNM individuals they sometimes use the language of social justice. For example, a monogamist might express the belief that one of the parties to a CNM relationship is being exploited by another, or is getting less love than they should (or could) be getting. Necessarily, this implies that other parties to the relationship are exploitative. Consider the following expressed opinions which we found in online discussions of polyamory which illustrate the link between zero-sum thinking and anti-CNM prejudice:

> "...It sounds like [polyamorous individuals] just don't know what they truly want yet or they do but they can't quite have it all so its [sic] about filling up their time with all this potential until they find someone solid... But if I only enjoy you for a 'part' of what you offer me, is it real love? Or is it convenience.... Are you so insecure that you will settle for crumbs of attention because you can't seem to find someone who wants to give you the whole loaf?" (DeLaine, 2015)

> "I believe my daughter is good enough to have a man who really loves her, and I don't think he does, because he has another girlfriend. Now she is thinking about moving in with this man, his girlfriend, and her other boyfriend. She says she's happy but I don't believe she can be in this situation [...] I think they are taking advantage of her and manipulating her into thinking she is happy [...] She has tried to tell me that 'love is infinite' and made analogies about children, but it doesn't work [...] Why should she settle for being with someone who only wants her some of the time, who only loves her with half his heart?" (DEZ1255, 2013)

A relationship may be considered fair if it provides parties with the resources that they need, want, or deserve to have. Some monogamists might therefore

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[2]Our assumption that cognitions precede feelings is generally consistent with appraisal theories of emotion (Ellsworth & Smith, 1988; Smith & Ellsworth, 1985).

perceive that CNM is unfair or immoral because they believe that individuals deserve more than they may obtain from such a relationship. In this way, anti-CNM prejudice might be understood as deriving in part from a basic concern for (distributive) justice or welfare (Folger, 1977). The two quotes above would seem to *prima facie* support this possibility.

2.4.2 Zero-sum thinking rationalizes anti-CNM prejudice

Alternatively, anti-CNM prejudice might reflect a zero-sum rationalization. Although monogamy is normative and valued in western cultures, so too is the tolerance of others whose opinions or practices differ from one's own, at least as long as nobody is harmed. For this reason, individuals with an anti-CNM bias might be motivated to simultaneously suppress their negative feelings and seek out justifications that would allow them to express these feelings; especially a justification that would construe CNM as harmful. The expression of anti-CNM prejudice might therefore hinge on the availability of a zero-sum interpretation of relationship resources (e.g., due to scarcity), because that would seem to imply that CNM might be unfair or immoral. Thus, the availability of a zero-sum interpretation should be expected to drive individuals who are implicitly prejudiced against CNM to express anti-CNM prejudice.

2.5 Hypotheses

Set against this backdrop, we made the following hypotheses. First, the *zero-sum thinking hypothesis* states that monogamous individuals perceive the allocation of relationship resources, like love, as a zero-sum situation. Second, the *zero-sum devaluation hypothesis* states that this zero-sum thinking about romantic relationships is associated with the devaluing of CNM relationships and individuals. Third, the *zero-sum rationalization hypothesis* posits that the expression of anti-CNM prejudice is more likely when a zero-sum interpretation is cognitively accessible. Predictions derived from these hypotheses are tested in the studies that follow.

2.6 Study 1

In this study, participants read a vignette that depicted characters in a CNM or monogamous relationship, and then judged aspects of the characters and their relationship. To measure zero-sum thinking, participants in the CNM condition judged the protagonist's love for their initial romantic partner, both before and after they became involved with a second partner. Zero-sum thinking was defined as the within-subject change in love ratings. In the Monogamy condition participants also judged love at two points in time as a baseline for comparison, to rule out that the differences found between the CNM conditions were due to time. In addition, participants evaluated aspects of the vignette relationship and characters in each condition as a measure of CNM devaluation.

2.6.1 Method

2.6.2 Participants

In all, 136 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during November 2015 (59 women, 76 men, 1 genderqueer; $M_{age} = 37.04, SD_{age} = 11.56$; 48 were single, 83 were in a relationship, 5 were separated or widowed; 111 identified as monogamous, 10 identified as monogamish, 8 identified with open relationships, 5 identified as polyamorous, and 2 identified as having an "other" relationship orientation). Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 95%. Participants were compensated with $0.75 USD, and the survey took approximately 5-8 minutes to complete. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#15OC014). Because we were interested in the responses of monogamous individuals, only the monogamous participants were analyzed (similar results were obtained with the monogamish participants included).

2.6.2.1 Materials and Procedure

Participants were randomly assigned to read a vignette that depicted two characters who were in a heterosexual monogamous or CNM ("open") relationship.

Vignettes were adapted from Conley et al. (2012). The CNM vignette was as follows:

> Dan has been in a serious relationship with Susie for two years and has become very close with her. Dan and Susie both work at full-time jobs and lead exciting lives outside of work, finding many fun activities to do together in their spare time. When they first started dating, Dan and Susie talked about the kind of relationship they wanted to have together. They agreed that an open relationship was what they both wanted, because it would allow them to have sexual and loving relationships with other people. They felt that this type of relationship would make them happiest. In the time that they have been together, neither Dan nor Susie has been sexually or romantically involved with anyone else.

In the Monogamy condition, the text was identical, except that Susie and Dan's relationship agreement was described as follows: "they agreed that monogamy, a relationship where they could not have sexual or loving relationships with anyone else, was what they both wanted." After reading the vignette, participants were asked to rate the extent to which the protagonist (hereafter "Susie") loved their initial partner (hereafter "Dan"). Participants were also asked to judge the quality of the relationship and the trustworthiness of the protagonist. The protagonist's gender was counterbalanced across participants by switching the names in the vignettes (i.e., in the male-protagonist version of the vignettes, "Dan" was the main character, and he had relationships with one (monogamy) or two (CNM) women).

After judging the initial vignette, participants read about a development in the relationship. In the CNM condition, this second vignette was as follows:

> It is now the third year of Dan's relationship with Susie. They continue to agree that an open relationship is best for them. Susie has been seeing someone new for a year; his name is Oliver. Susie has developed strong feelings for Oliver. Susie and Oliver have a great sexual chemistry, they also share all of the same values, and Susie often thinks about Oliver when they are apart. Although Dan has dated a few people other than Susie, he has not developed feelings for anyone else.

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In the Monogamy condition, it was stated that it is the third year of Susie and Dan's relationship, that they continue to agree that monogamy is best for them, and that they had respected the agreement to be monogamous. After reading this second vignette, participants again rated how much Susie loved Dan.

A key aspect of this design is that participants provided two ratings of Susie's love for Dan. In the CNM version, love ratings were given before and after Susie developed a meaningful relationship with a second partner. According to the zero-sum thinking hypothesis, participants should perceive that Susie loves Dan less after learning about her second partner. This is because, although the characters and their relationship agreement are identical, there is now a second partner to receive Susie's relationship resources. Furthermore, the zero sum-devaluation hypothesis predicts that zero-sum thinking should be associated with negative judgments of relationship quality and trustworthiness in the CNM condition as compared to the monogamous condition. Specifically, the change in love ratings should mediate the association between relationship type and these judgments.

Measures. Participants rated how much Susie loved Dan ("How much do you think Susie loves Dan?" and then "Based on what you know now, how much do you think Susie loves Dan?") on a scale of 1 (not at all) to 7 (very much). Using these ratings, love-change scores were computed by taking the difference between the first ("before") and the second ("after") love ratings (after minus before). In the CNM condition, a negative value would reflect the judgment that Susie loved Dan less after she had developed a relationship with Oliver. In the Monogamy condition, a negative would reflect the judgment that Susie loved Dan less after time had elapsed in their relationship.

Participants also rated the quality of Susie and Dan's relationship ("If Susie and Dan continue to be [monogamous / in an open relationship], how satisfied do you think they will be with their relationship over the long-term?" on a scale of 1 (very unsatisfied) to 7 (very satisfied), and "How likely is it that Susie will still be in a relationship with Dan after 5 years?") on a scale of 1 (very unlikely) to 7 (very likely). Finally, participants rated the trustworthiness of Susie ("How trustworthy do you think Susie is?") on a scale of 1 (very untrustworthy) to 7 (very trustworthy).

After responding to the vignette, participants answered demographic questions (age, gender, education, and relationship status). Participants also reported their relationship orientation as monogamous, monogamish, swinging, open, or

polyamorous; a definition was provided for each option, as summarized in Table 2.1.

Table 2.1: Definitions provided to participants when asking them to select a relationship orientation.

Relationship	Definition
Monogamy	A relationship where you are committed to one other person and that person is who you share all romantic and sexual experiences with.
Monogamish	A relationship where you and your partner agree that it is acceptable to have sex with other people, but only when you are both present (e.g., in 'threesomes').
Swinging	A relationship where you and your partner exchange partners with other couples for sex.
Open	A relationship where you and your partner agree that it is acceptable to have romantic and/or sexual relationships with other people.
Polyamorous	A relationship where you and your partner agree that it is possible, acceptable, and desirable to love multiple people, and to maintain multiple romantic and/or sexual relationships, with the knowledge and consent of everyone involved.

2.6.3 Analyses

2.6.3.1 Zero-Sum Thinking

Zero-sum thinking was tested using a one-sample t-test in the CNM condition, comparing mean love-change scores against the value of zero. In the CNM condition, zero-sum thinking would be indicated by a value less than zero. We also

performed this test in the Monogamy condition, though the difference would be interpreted merely as a change over time.

As predicted, in the CNM condition, love-change scores were less than zero ($M = -1.65, SD = 1.23; t(53) = -10.11, p < .001, d = 1.34$). In the Monogamy condition, love-change scores were marginally greater than zero ($M = 0.09, SD = 0.40; t(56) = 1.70, p = .096, d = 0.23$). See Section A.1 of the Appendix for a summary of diagnostics.[3]

2.6.3.2   Evaluative Judgments

Mean responses to the relationship quality (Satisfaction and Longevity) and Trustworthiness questions were compared between the CNM and Monogamy conditions. Mean responses in each condition were also compared to the midpoint of the rating scale, which assumes that the midpoint indicates a neutral judgment—an assumption that seemed reasonable given that the scale extremes were worded to indicate polar-opposite judgments (i.e., "very unsatisfied" to "very satisfied"). This midpoint comparison is meaningful because it allows for an interpretation beyond relative devaluation, as judgments in one condition are assessed for their positivity or negativity independent of the other condition.

As expected, all evaluative judgments were higher for Monogamy than CNM ($ps < .001$, smallest $d = 2.00$). In the Monogamy condition, all items were higher than the scale midpoint ($ps < .001$). In the CNM condition, all evaluative ratings were lower than the scale midpoint ($ps < .05$, smallest $d = 0.31$). See Table Table 2.2 for a summary of sample sizes, means, and standard deviations; see Table Table 2.3 for a summary of t-tests. See Section A.1 of the Appendix for a summary of diagnostics.[4]

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[3]No differences were found in zero-sum thinking related to the participants' gender, the vignette protagonist's gender, or the participants' relationship status.

[4]No differences were found in evaluative judgments related to the participants' gender, the vignette protagonist's gender, or the participants' relationship status.

Table 2.2: Sample sizes, means, and standard deviations for evaluative ratings (rating scale range = 1-7).

Condition	Rating	N	Mean	SD
Monogamy	Satisfaction	54	6·43	0·72
	Longevity	54	6·11	1·06
	Trustworthiness	54	6·33	0·75
CNM	Satisfaction	57	2·21	1·24
	Longevity	57	2·07	1·19
	Trustworthiness	57	3·53	1·54

Table 2.3: Tests of evaluative ratings in Monogamy vs. CNM conditions, and ratings vs. scale midpoint.

Rating	Comparison	t	df	p	d
Satisfaction	Monogamy vs. CNM	22·13	90·73	$<$·001	4·17
	Monogamy vs. Midpoint	24·88	53	$<$·001	3·39
	CNM vs. Midpoint	$-10\cdot94$	56	$<$·001	1·45
Longevity	Monogamy vs. CNM	18·91	108·54	$<$·001	3·58
	Monogamy vs. Midpoint	14·66	53	$<$·001	2·00
	CNM vs. Midpoint	$-12\cdot21$	56	$<$·001	1·62
Trustworthiness	Monogamy vs. CNM	12·32	82·36	$<$·001	2·32
	Monogamy vs. Midpoint	22·79	53	$<$·001	3·10
	CNM vs. Midpoint	$-2\cdot33$	56	·053	0·31

Table 2.4: Mediation analyses.

Outcome	Indirect Effect			Direct Effect		
	B	CI Lower	CI Upper	B	t	p
Satisfaction	−0·50	−0·93	−0·14	−3·72	−14·41	<·001
Longevity	−0·45	−0·92	−0·05	−3·59	−12·38	<·001
Trustworthiness	0·02	−0·59	0·59	−2·83	−8·82	<·001

2.6.3.3 Mediation Analyses

We hypothesized that zero-sum thinking (love change scores) would mediate the association between relationship type (CNM or Monogamy) and evaluative judgments. This mediation model is illustrated in Figure 2.1. To test the model, we performed bootstrap analyses to obtain bias-corrected confidence intervals (Hayes, 2009, 2013). For each analysis, we report the indirect (mediation) effect and the direct effect. Mediation analyses were performed separately for each of the evaluative judgments (Satisfaction, Longevity and Trustworthiness) using a bias-corrected bootstrap procedure with 10,000 samples. For each analysis, we report the indirect (mediation) effect. See Section A.1 in the Appendix for diagnostics.
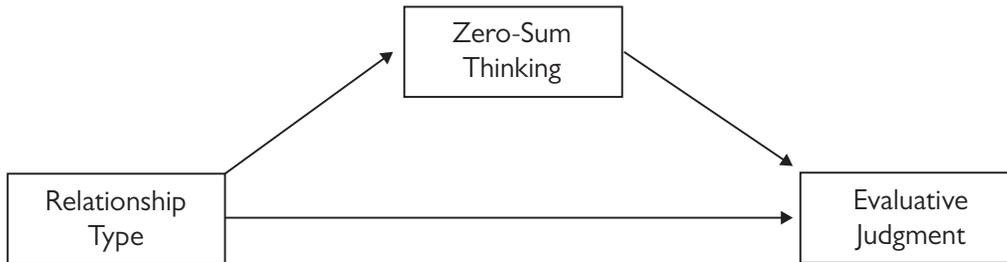
Figure 2.1: Hypothesized mediation model, in which zero-sum thinking is hypothesized to mediate the association between relationship type and evaluative judgment.

The results of the bootstrapped analysis is summarized in Table 2.4. As this table indicates, love change scores partially mediated the effect of experimental vignette (CNM or Monogamy) on Satisfaction; and partially mediated the effect with Longevity. However, mediation was not observed with Trustworthiness.

2.6.4 Discussion

This experiment tested the zero-sum thinking hypothesis by asking individuals to judge a CNM character's love for one partner before and after they became involved with a second partner. Zero-sum thinking was operationalized as the difference between these two love judgments in the CNM condition. CNM devaluation was measured by asking for judgments about relationship quality and trustworthiness. This experiment tested the zero sum-devaluation hypothesis, which predicted that such zero-sum thinking should be associated with more negative evaluations of CNM relationships and individuals as compared to monogamous ones.

Supporting the zero-sum thinking hypothesis, love ratings were lower in the CNM condition after Susie became involved with someone else. Reflecting CNM devaluation, mean evaluative judgments were lower in the CNM condition when compared to the monogamous condition, and when compared to the midpoint of the scale. Thus, participants not only devalued the CNM relationship relative to an equivalent monogamous relationship, but viewed the CNM relationship negatively in general. Crucially, we obtained preliminary evidence in support of the zero sum-devaluation hypothesis. Mediation analyses revealed that zero-sum thinking (love change scores) mediated the association between relationship type and two ratings of relationship quality, suggesting that one of the reasons why individuals would judge the quality of a relationship to be lower is if they perceive that relationship resources are being strained (i.e., because love is scarce). Yet, we found that zero-sum thinking did not mediate the association between relationship type and ratings of trustworthiness.

One possible explanation is that trustworthiness is a character trait that is not strongly related to resource concerns in this context, whereas other character

traits may be more relevant. Specifically, Dan and Susie both agreed to practice CNM, and were behaving in accordance with that agreement. The difference in trustworthiness ratings between the relationship conditions was less than that other evaluative judgements, which suggests that trustworthiness ratings reflected a different interpretive process. We speculate that resource concerns may not have been driving this difference.

2.7 Study 2

In contrast to the first study which involved the experimental manipulation of resource concerns, this second study measures trait differences in zero-sum thinking about relationships using a newly developed Zero-Sum Romantic Beliefs (ZSRB) scale. CNM devaluation was also measured using a more comprehensive rating scale. We expected that if individuals devalue CNM relationships and individuals because of zero-sum resource concerns, then individuals who more strongly endorse zero-sum romantic beliefs should more strongly devalue CNM relationships and individuals.

2.7.1 Method

2.7.1.1 Participants

In all, 129 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during November 2015 (55 women, 74 men; $M_{age} = 35.40, SD_{age} = 11.54$; 39 were single, 84 were in a relationship, 4 were separated or widowed, and 1 answered that they were never married; 112 identified as monogamous, 8 identified as monogamish, 3 identified with open relationships, and 5 identified as polyamorous). Participants were compensated with $0.75 USD, and the survey took approximately 5-8 minutes to complete. Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 95%. A script was used to ensure that none of the participants had participated in the previous studies. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board

(#15OC014). Because we are interested in the responses of monogamous individuals, only the monogamous participants were analyzed (similar results were obtained with the monogamish participants included).

2.7.1.2 Materials and Procedure

As in Study 1, participants were randomly assigned to read a vignette that depicted a heterosexual monogamous or CNM ("open") relationship. The vignettes were identical to those used previously, with the major change being that the two vignette parts ("before" and "after") were combined into a single vignette. The CNM vignette was as follows:

> Dan has been in a serious relationship with Susie for two years and has become very close with her. Dan and Susie both work at full-time jobs and lead exciting lives outside of work, finding many fun activities to do together in their spare time. When they first started dating, Dan and Susie talked about the kind of relationship they wanted to have together. They agreed that an open relationship was what they both wanted, because it would allow them to have sexual and loving relationships with other people. They felt that this type of relationship would make them happiest.
>
> In the second year of their relationship, Susie started to see someone new; his name is Oliver. Susie has been seeing Oliver for a year now, and she has developed strong feelings for him. Susie and Oliver have a great sexual chemistry, they also share all of the same values, and Susie often thinks about Oliver when they are apart. Although Dan has dated a few people other than Susie, he has not developed feelings for anyone else.

In the Monogamy condition, the first paragraph had some changes, and the second paragraph was omitted. Specifically, in the Monogamy condition, Susie and Dan's relationship agreement was described as follows: "they agreed that monogamy, a relationship where they could not have sexual or loving relationships with anyone else, was what they both wanted." In addition, it was also stated in the Monogamy condition that "in the time that they have been together, neither Dan nor Susie has been sexually or romantically involved with anyone else."

Measures.   After reading the vignette, participants completed a 16-item measure of evaluative judgments adapted from Conley et al. (2012). Participants rated the relationship between the two main characters in comparison to the average relationship ("Compared to most couples, I think Susie and Dan's relationship is...") on the following dimensions: trusting, reliable, comfortable, mature, dependable, meaningful, safe, natural, and moral. Participants also rated the two main characters in comparison to most individuals ("Compared to most individuals, I think Susie and Dan are...") on the following dimensions: honest, committed, trusting, emotionally secure, happy, in love, and romantic. Items were presented as interval rating scales ranging from -3 ("Less [adjective]") to +3 ("More [adjective]").

A four-item measure of zero-sum beliefs (ZSRB) was developed for this study. One item was designed to measure entitlement beliefs, and three items were designed to measure scarcity beliefs. Each statement was presented 7-point interval rating scale ranging from -3 ("Disagree strongly") to +3 ("Agree strongly"). See Table 2.5 for the item statements. After responding to the vignette and the evaluative judgments and ZSRB scales, participants were then asked demographic questions (age, gender, education, relationship status, and relationship orientation).

2.7.2   Analyses

Responses to the evaluative judgments and ZSRB items were transformed (from -3 to +3) to a 1-7 scale for the analyses.

2.7.2.1   Zero-Sum Romantic Beliefs (ZSRB)

Before computing a single composite score for ZSRBs, we performed a components analysis (Jolliffe, 2010) and a test of internal consistency reliability (Cronbach, 1951). The first component explained 61% of the variance in responses, while the second component explained only an additional 18% of the variance. Further, a visual inspection of the scree plot produced from this components analysis, presented in Figure 2.2, indicated a sharp break after the first component. Thus, we concluded that a single component solution was appropriate. Internal consistency was also acceptable, as Cronbach's α was .79 (bootstrapped 95% CI = [.68, .86]), and alpha-if-item-deleted analyses revealed that
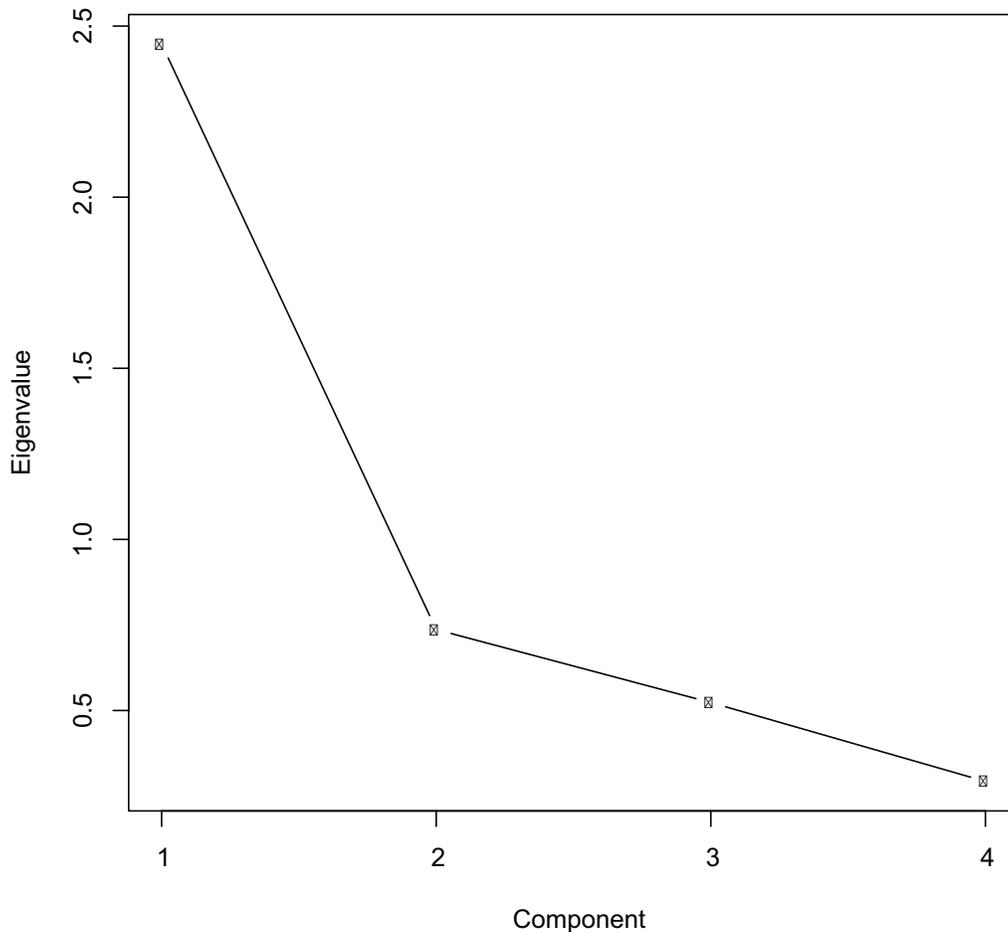
Figure 2.2: Scree plot for Zero-Sum Romantic Beliefs eigenvalues.

could not be improved by deleting any one of the items. Thus, a composite score was calculated by averaging ratings (Item 2 was reverse-scored).

Supporting the zero-sum thinking hypothesis, there was a pattern of strong endorsement. Overall, the mean ZSRB score was 5.32 ($SD = 1.34$), and a majority of participants scored 6 or higher (63%, or 71 out of 112). The mean score was also higher than the scale midpoint ($t(111) = 10.40, p < .001, d = .98$). Similarly, mean responses for all individual items were greater than the midpoint ($ps < .001$, smallest $d = .43$). Thus, monogamists generally appear

to hold the beliefs that we assume underlie zero-sum thinking about relationship resources. See Table 2.5 for a summary of item means and standard deviations.

Although the number of participants who identified as CNM (open or poly) was small ($N = 10$), it is worth noting that their average ZSRB endorsement was lower than participants who identified as monogamous ($M = 2.80; SD = 0.86; t(15.30) = -8.79, p < .001, d = 2.24$), and also lower than the scale midpoint ($t(10) = -4.66, p < .001, d = 1.41$). This is consistent with the possibility that ZSRBs are unique to monogamous individuals.

Table 2.5: Zero-Sum Romantic Beliefs (ZSRB) sample sizes, means, and standard deviations (rating scale range = 1-7).

Item	Statement	N	Mean	SD
1	In a romantic relationship, a person deserves all of their partner's love.	112	6·00	1·33
2*	A person's capacity for romantic love is infinite. It is possible to love many people at the same time without loving anyone less.	112	4·79	1·84
3	Romantic love is like a pie — if you share it with more than one person at a time, then each person will get less.	112	5·25	1·84
4	In a romantic relationship, you can only fully love one person at a time.	112	5·23	1·82

Note: * indicates reverse-coding.

2.7.2.2 Evaluative Judgments

Before computing a single composite score for ZSRBs, we performed a components analysis (Jolliffe, 2010) and a test of internal consistency reliability (Cronbach, 1951). Because participants in the Monogamy and CNM conditions were
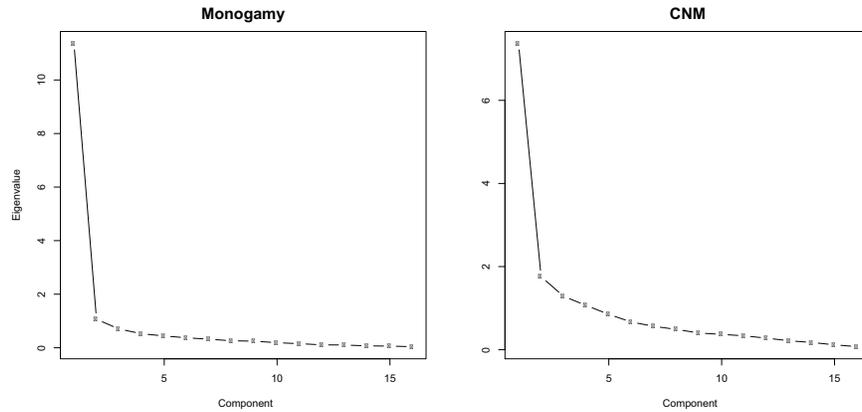
Figure 2.3: Scree plot for Evaluative Judgment eigenvalues.

evaluating different targets, these analyses might be expected to produce different results in each condition. Thus, we examined the Monogamy and CNM conditions separately. In the Monogamy condition, the first component explained 71% of the variance in responses, while the second component explained only an additional 7% of the variance. In the CNM condition, the first component explained 46% of the variance in responses, while the second component explained only an additional 11% of the variance. A visual inspection of the scree plots in each condition, presented in Figure 2.3, indicated a sharp break after the first component in each case. Thus, we concluded that a single component solution was appropriate. Internal consistency was also acceptable. In the Monogamy condition, Cronbach's α was .97 (bootstrapped 95% CI = [.95, .98]), and in the CNM condition it was .91 (bootstrapped 95% CI = [.87, .94]). Alpha-if-item-deleted analyses revealed that alpha could not be improved by deleting any one of the items. Thus, a composite score was calculated by averaging ratings.

As expected, ratings were more positive in the Monogamy condition than in the CNM condition ($M_{Mono.} = 5.84, SD_{Mono.} = 0.96; M_{CNM} = 2.95, SD_{CNM} = 0.98; t(109.95) = 15.79, p < .001, d = 2.99$). Further, in the Monogamy condition scores were above the scale midpoint ($t(54) = 14.18, p < .001, d = 1.91$), and in the CNM condition scores were below the scale midpoint ($t(56) = -8.15, p < .001, d = 1.08$).

2.7.2.3 Correlations between ZSRB and Evaluations of CNM and Monogamy

As a preliminary test of our hypothesis that zero-sum thinking about romantic relationships causes individuals to devalue CNM relationships and individuals, we examined the correlation between ZSRB and evaluative judgments separately in the CNM and Monogamy conditions. Consistent with our hypothesis, in the CNM condition ZSRB scores were negatively associated with evaluative judgments ($r = -.71$, 95% CI $= [-.82, -.56]$), whereas in the Monogamy condition ZSRB scores were positively associated with evaluative judgments ($r = .65, 95\%$ CI $= [.46, .78]$). Thus, stronger zero-sum romantic beliefs were associated with more negative evaluations of CNM and more positive evaluations of monogamy.

2.7.2.4 Moderation Analysis

Next, we investigated whether ZSRBs moderated the association between relationship type and evaluative judgments. We performed a moderated regression analysis in which the dependent variable was evaluative judgment scores, the moderator was ZSRBs, and the predictor was Relationship Type (Monogamy or CNM). In the first step, ZSRBs and Relationship Type were entered into the model. In the second step, their interaction was added to the model.

The first step was significant ($F(2, 109) = 123.59, p < .001$), explaining 69% of the variance in evaluative judgments. The second step explained an additional 14% of the variance, which was significant ($F(3, 116) = 184.17, p < .001$). Next, we decomposed the interaction by performing a simple slope analysis (Bauer et al., 2007; Cohen et al., 2003; Rogosa, 1980). As recommended by Cohen et al. (2003), we tested the slopes when zero-sum romantic beliefs were one standard deviation above the mean, at the mean, and one standard deviation below the mean. To complement this method, we also calculated the region of significance (Bauer et al., 2007; Rogosa, 1980), which reflects the range of values on the moderator in which the slope is significantly different from zero.

At one standard deviation below the mean of zero-sum romantic beliefs, the simple slope was -1.53 ($SE = .20, t(111) = -7.83, p < .001$), indicating higher evaluative judgments for the Monogamy (vs. CNM) condition. At the mean, the simple slope was -2.88 ($SE = .14, t(111) = -21.18, p < .001$).
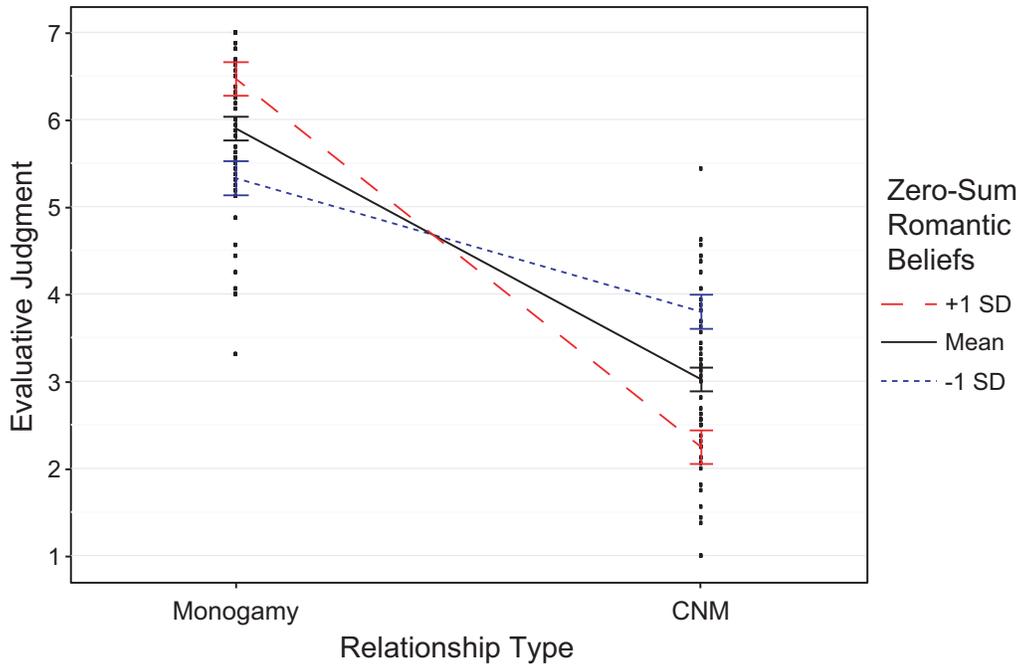
Figure 2.4: Simple slopes of relationship type predicting evaluative judgment scores for 1 SD above the mean of zero-sum romantic beliefs, at the mean of zero-sum romantic beliefs, and 1 SD below the mean of zero-sum romantic beliefs; error bars = 1 SE.

At one standard deviation above the mean, the simple slope was -4.22 ($SE = .19, t(111) = -21.92, p < .001$). Taken together, these three values of the simple slope confirm that CNM devaluation increases as zero-sum romantic beliefs increase. Moreover, the region of significance was -2.73 to -1.73 standardized units of ZSRBs, meaning all slopes calculated outside of this region were significant. Thus, CNM devaluation increased as ZSRBs increased. See Figure 2.4 for a visual summary. See **??** in the Appendix for diagnostics.

2.7.3 Discussion

This study replicated previous findings that individuals devalue CNM relationships and individuals (Conley et al., 2012). Crucially, this study provided a

further test of the zero-sum thinking hypothesis by administering a scale measuring trait zero-sum romantic beliefs, and it also provided a further test of the zero sum-devaluation hypothesis by examining trait zero-sum romantic beliefs as a moderator of the association between relationship type and evaluative judgments. The results of this study suggest that individuals who hold stronger zero-sum romantic beliefs evaluate CNM more negatively relative to monogamy. These results are consistent with the findings of Study 1, and provide additional support for the hypothesized role of zero-sum thinking in promoting CNM prejudice.

Zero-Sum Romantic Beliefs (ZSRBs) were strongly endorsed by the participants, as evidenced by the mean scores, and by the majority of participants who indicated their strong agreement. It might be tempting to interpret such strong endorsement as a sign of poor scale construction. For example, items may be skewed if statements use "weak" wording, such that the only "reasonable" response is to register an extreme position of agreement or disagreement. Against this criticism we would point out that responses were anchored by "strong" agreement or disagreement, and the items generally made strong statements about romantic relationships. Instead, we argue that many monogamous individuals frequently/commonly hold strong zero-sum romantic beliefs.

The findings in this study are consistent with what one would expect if zero-sum romantic beliefs caused CNM devaluation. Because it is a trait measure, it would not be appropriate to draw causal conclusions from the data. However, these findings are consistent with Study 1 in which a causal mediation model was used to test the role of zero-sum thinking in CNM devaluation. Importantly, we believe these two studies complement each other, in that one evaluated the causal association, whereas the other unequivocally assessed zero-sum thinking at the explicit level.

2.8   Study 3

The rationalization hypothesis prediction that individuals who experience negative affect towards CNM will be more likely to express a negative judgment of CNM if a zero-sum interpretation is cognitively accessible is tested. To this end, we introduce a new character—Susie's mother—who, in one of the CNM conditions, expresses disapproval of Susie's relationship with Dan and provides

a zero-sum rationale for her disapproval. In the other conditions, the mother merely expresses her disapproval.

2.8.1 Method

2.8.1.1 Participants

In all, 196 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during November 2015 (89 women, 107 men; $M_{age} = 35.34, SD_{age} = 11.56$; 67 were single, 118 were in a relationship, 10 were separated or widowed, and 1 did not answer the question; 173 identified as monogamous, 9 identified as monogamish, 6 identified with open relationships, 7 identified as polyamorous, and 1 identified as having an "other" relationship orientation). Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 95%. A script was used to ensure that none of the participants had participated in the previous studies. Participants were compensated with $0.75 USD, and the survey took approximately 5-8 minutes to complete. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#15OC014). Because we are interested in the responses of monogamous individuals, only the monogamous participants were analyzed (similar results were obtained with the monogamish participants included).

2.8.1.2 Materials and Procedure

Participants were randomly assigned to read a vignette that depicted two characters who were in a heterosexual monogamous or CNM ("open") relationship. Vignettes were based on those used in Study 1. The major change was the addition of a new character (Susie's mother), who expressed disapproval of her relationship with Dan. In the conditions used previously, disapproval was stated as follows: "Even though Susie recently found out that her mother doesn't approve of her relationship with Dan, she is staying in a relationship with him." A new condition was also created (CNM+R), in which Susie's mother rationalized her disapproval:

Until recently, Susie has been "in the closet" about the nature of her relationship with Dan. She recently opened up to her mom, who expressed concern. In the hopes that Susie might reconsider her relationship with Dan, her mother said the following: "I believe you are good enough to have a man who really loves you, and I don't think he does, because he has another girlfriend. You tell me you're happy but I don't believe you can be in this situation. You say that 'love is infinite', but in my experience that's just not true. Why should you settle for being with someone who only wants you some of the time, who only loves you with half of his heart?"

Thus, the disapproval of Susie's mother was held constant across the three conditions. It was only in the CNM+R condition that Susie mother provided a zero-sum justification for why she disapproved of Susie's relationship with Dan.

Measures. The measure of evaluative judgments from Study 2 was used to assess CNM devaluation. After reading the vignette and responding to the evaluative judgment items, participants answered demographic questions (age, gender, education, and relationship status), and reported their relationship orientation (monogamous, monogamish, swinging, open, or polyamorous) as in previous studies.

2.8.2 Analyses

2.8.2.1 Evaluative Judgments

Responses to the evaluative judgments were transformed (from -3 to +3) to a 1-7 scale for the analyses. Again, we examined the reliability of evaluative judgments separately in the Monogamy and (combined) CNM conditions. In the Monogamy condition, Cronbach's α was .98 (bootstrapped $95\% \; CI = [.96, .98]$), and in the combined CNM conditions it was .93 (bootstrapped $95\% \; CI = [.90, .95]$), which suggests that the scale was best captured by a single dimension. Alpha-if-item-deleted analyses revealed that alpha could not be improved by deleting any one of the items. A supplementary analysis was also performed that examines the ω_h coefficient, see Section A.4 of the Appendix. Thus, a composite score was calculated by averaging ratings.

The omnibus ANOVA revealed that there was a significant difference in scores between the three conditions ($F(2, 170) = 154.33, p < .001, \eta_p^2 = .65$). Post-hoc comparisons revealed that scores were more positive in the Monogamy condition than in the CNM' condition ($M_{Mono.} = 5.85, SD_{Mono.} = 0.95; M_{CNM'} = 3.10, SD_{CNM'} = 1.10; t(113) = 14.31, p < .001, \eta_D = 2.67$), more positive in the Monogamy condition than in the CNM+R condition ($M_{CNM+R} = 2.96, SD_{CNM+R} = 0.92; t(113) = 16.60, p < .001, \eta_D = 3.10$), but scores did not differ between the CNM' and CNM+R conditions ($t(114) = 0.78, p = .219, \eta_D = 0.15$). Furthermore, t-tests revealed that in the Monogamy condition scores were above the scale midpoint ($t(56) = 14.67, p < .001, \eta_D = 1.95$); in the CNM' condition scores were below the scale midpoint ($t(57) = -6.20, p < .001, \eta_D = 0.81$); and in the CNM+R condition scores were also below the scale midpoint ($t(57) = -8.65, p < .001, \eta_D = 1.14$). See Section A.3 in the Appendix for diagnostics.

2.8.3 Discussion

In this study, we sought to manipulate the cognitive accessibility of a zero-sum interpretation by introducing another actor, the mother of Susie, who expressed disapproval of Susie's relationship with Dan and also expressed a zero-sum rationale as the basis for her disapproval in one of the conditions. The mother disapproved of Susie's relationship with Dan in both the CNM' and CNM+R conditions (and also in the Monogamy condition), but her zero-sum rationale was present only in the CNM+R vignette. Thus, CNM' devaluation was expected to be greater the CNM+R condition than in the CNM' condition. Against this prediction, no difference was observed between these conditions on mean evaluation scores. Thus, the rationalization hypothesis was not supported.

There are several possible explanations for these null results. First, MTurk provides participants with pseudonymity, which one might expect to have decreased the reputational concerns that would be necessary to create a motivation for rationalization. However, we would argue that reputational pressure was present in the form of how participants might have imagined their responses would appear to the researcher. Further, at least one study has found high social desirability with an MTurk sample (Behrend et al., 2011), which would seem to count against pseudonymity being an issue.

Second, individuals might not have felt the need to rationalize their anti-CNM responses because their experience in a culture where monogamy is the descriptive and injunctive norm lead them to not anticipate any social repercussions for expressing such an opinion. Along these lines, it has been found that individuals with racist attitudes are more likely to express prejudice when they perceive that their attitudes are shared by a consensus of others Sechrist & Stangor (2001). It follows from this that the need to rationalize anti-CNM prejudice might depend on the individual's perception that their anti-CNM feelings are not shared by a consensus of others. One situation that would meet this criteria would be if individuals were in the presence of CNM individuals or allies of CNM individuals, as this would lead the individual to feel that they might or might not be challenged for expressing their prejudice.

Third, our attempt to make a zero-sum rationalization cognitively accessible to participants could have failed because the expressed opinion of Susie's mother was disregarded. This possibility would be consistent with the lack of difference in evaluation scores when comparing the CNM conditions in Study 2 and Study 3. Indeed, it is logical to assume that source credibility would a determinant of whether a rationalization would be perceived to provide a reliable defense for one's expression of prejudice. This is at least indirectly supported by the literature on source credibility with regards to persuasion (e.g., Petty & Cacioppo, 1984).

Finally, in the event that the presentation of a rationalization had been associated with more reported anti-CNM prejudice, it would be important to implement a methodology that could distinguish between direct and moderating effects. In the case of a direct effect, the presentation of a rationalization would be assumed to generate the prejudice itself. Whereas a moderating effect would assume a preexisting (implicit) prejudice that gets expressed (explicitly) to a greater or lesser extent in response to the rationalization. Had an effect been observed, the present methodology would not have been able to completely distinguish between these two possibilities. To this end, a methodology that measures both implicit and explicit anti-CNM prejudices could be used.

2.9 General Discussion

In this chapter, we proposed that zero-sum thinking is one of the bases of anti-CNM prejudice. We suggested that individuals who believe that relationship resources are scarce, or that parties to a relationship are entitled to all of them, perceive the allocation of said resources to be zero-sum. In turn, when these individuals are faced with the prospect of a relationship in which an individual has more than one partner, they judge that relationship and the individuals in the relationship to be unworthy or immoral.

Our hypotheses were two-fold. First, we hypothesized that some individuals would be predisposed to zero-sum thinking because they believe that romantic relationship resources like love are scarce, and/or because they value exclusivity in romantic relationships (which we described as "entitlement beliefs"). Second, we hypothesized that zero-sum thinking would be associated with CNM devaluation. We tested these hypotheses in two studies.

In Study 1, we asked participants to judge a CNM character's love for one partner before and after this character became involved with a second partner. Here, zero-sum thinking was defined as the change in love ratings in the CNM condition. We also asked individuals to rate relationship quality as well as the protagonist's trustworthiness. Supporting the zero-sum thinking hypothesis, we observed that mean love ratings in the CNM condition decreased after Susie became involved with someone new. Consistent with CNM prejudice, we found that evaluative judgments were more negative in the CNM condition than in the monogamy condition, as well as lower than the midpoint of the scale in the CNM condition. Providing support for the zero sum-devaluation hypothesis, we found that zero-sum thinking partially mediated the association between relationship type and ratings of relationship quality. We did not obtain any evidence of mediation with ratings of the trustworthiness. We can conclude that this suggests zero-sum thinking is at least in part responsible for the devaluation of CNM relationships.

In Study 2, we predicted that if zero-sum thinking causes CNM devaluation, then those who more strongly endorse zero-sum romantic beliefs should more strongly devalue CNM relationships and individuals. To test this hypothesis, we introduced a new 4-item trait measure of Zero-Sum Romantic Beliefs (ZSRBs), and used a more comprehensive 16-item measure of evaluative judgments in order to assess CNM devaluation. Supporting the zero-sum thinking hypothesis,

we found that ZSRBs were strongly endorsed by a majority of monogamous participants. Consistent with the zero sum-devaluation hypothesis, we found that trait differences in ZSRBs moderated the association between relationship type and evaluative judgments. Specifically, we found that individuals with stronger ZSRBs more strongly devalued CNM individuals and their relationships.

In Study 3, we tested the rationalization hypothesis by introducing a character, Susie's mother, who in one of the CNM conditions expressed disapproval of Susie's relationship with Dan and provided a zero-sum rationale for her disapproval. In the other conditions, the mother merely expressed her disapproval. We measured CNM prejudice using the same evaluative judgments measure as in Study 2. We predicted that anti-CNM bias would be more pronounced in the rationalization condition, but the analyses did not support this prediction. We suggested three possible reasons for the null findings: 1) the anonymous nature of the experiment, 2) the descriptive and injunctive normativity of monogamy that likely characterized participants' everyday experience, and 3) the source credibility of Susie's mother.

We tested the role of a zero-sum rationalization in promoting the expression of anti-CNM prejudice, but we did not test the reputation-defense function. The reputation-defense function suggests that if an individual's expression of anti-CNM prejudice is accompanied by a zero-sum explanation, then that individual should be perceived as less prejudiced, relative to an individual who expresses anti-CNM prejudice with a different explanation (or none at all). A modification of Section 2.8 might have tested this, for example, by asking individuals to evaluate Susie's mother.

We believe the convergent findings obtained from Study 1 and Study 2 support our proposal that zero-sum thinking promotes consensual nonmonogamy prejudice. Evidence from these studies suggest that monogamous individuals tend to strongly endorse zero-sum romantic beliefs about relationships, and when presented with a CNM relationship, they perceive a trade-off or loss of relationship resources which causes them to negatively evaluate the relationship. Moreover, our findings from Study 2 demonstrate that monogamous individuals do not distinguish between CNM relationships and CNM individuals, and thus rate both more negatively.

An outstanding question concerns *why* some monogamous individuals interpret CNM relationships in zero-sum terms, or why they come to believe that relationship resources like love are scarce. One possibility is that monogamous

individuals learn this perspective through their experiences with relationships wherein a zero-sum logic would be correct. For example, when an individual in a monogamous relationship starts seeing someone other than their monogamous partner, this might signal a betrayal of trust or a divestment of resources in the original partner. From this perspective, such zero-sum thinking might be interpreted as a mis-application of zero-sum logic or beliefs, from one domain in which it is normally correct (monogamy) to another domain in which it is arguably incorrect (CNM).

Finally, it may be noted that in examining the role of zero-sum thinking in CNM prejudice, we do not wish to argue that CNM relationships are in no way zero-sum. Indeed, there appears to be a general recognition of real-world limits within the CNM community (Easton & Hardy, 2009), such as with time, and many CNM authors have discussed how to manage these limitations, such as with effective time management (Anapol, 2010). However, we believe the resource concerns that some individuals who practice monogamy have about CNM relationships are largely misplaced. Although research into the well-being of individuals in CNM relationships is limited, in a recent literature review Rubel & Bogaert (2015) found that individuals who practice CNM report similar levels of well-being and relationship satisfaction as individuals who practice monogamy. Furthermore, if loving CNM relationships were zero-sum in practice, then one would expect there to be a trade-off between how satisfied an individual is with one relationship and how satisfied they are with a second relationship. Contrary to this expectation, Mitchell et al. (2014) observed in a recent study of need fulfillment in polyamorous relationships that the satisfaction individuals report with one of their loving relationships is unrelated to the satisfaction they report with another concurrent loving relationship. Thus, CNM relationships do not appear to conform to the zero-sum expectations that some individuals who practice monogamy project onto these relationships.

2.9.1 Limitations

The main limitation of our studies was that we only examined heterosexual relationships. It is an open question whether these findings would generalize to CNM relationships involving individuals with other sexual or romantic orientations. Another limitation of the vignettes was the fact that Susies and Dans practice of CNM was asymmetrical: whereas Susie had met someone else whom

she was very fond of, Dan had just been dating. It is likely that individuals would evaluate a symmetrical CNM relationship differently than an asymmetrical CNM relationship in some respects, and to some extent the present findings of devaluation might have been inflated by this property of the vignettes. For example, individuals might view this asymmetry as a reflection of inequality within their relationship. However, CNM might be viewed as detrimental from a zero-sum perspective regardless of whether the relationship is symmetrical. In a symmetrical relationship, it could still be argued that Susie is dividing her love between two partners, and thus that Susie loves Dan less. Similarly, although one might argue that a symmetrical relationship would provide parties with an equal share of love when all partnerships are considered, whereas an asymmetrical relationship would not, this would also seem to presuppose a zero-sum allocation. For these reasons, we do not believe that the asymmetrical nature of the vignettes undermines the validity of our findings. Moreover, we believe that understanding the role of zero-sum thinking in response to CNM relationships that are perceived as asymmetrical is important because it is likely to represent the actual circumstances of many such relationships. Even when two partners agree to CNM at the same time, they may meet others at different times, develop relationships at different rates, and so forth. It is unlikely that both members of a dyad would develop their extra-dyadic relationships in an identical manner simultaneously, and thus most CNM relationships are likely to be asymmetrical in practice at some point.

It might be tempting to criticize the studies in this chapter for sampling exclusively from Amazon's Mechanical Turk (MTurk). However, we would point out that MTurk samples have been found to be more representative of the United States population than in-person samples (Berinsky et al., 2012), and more diverse than other Internet samples and undergraduate samples (Buhrmester et al., 2011). MTurk participants also appear to be more attentive than undergraduate participants (Hauser & Schwarz, 2015), and many classic effects in psychology have been replicated using MTurk samples (Crump et al., 2013; Paolacci et al., 2010). It might also be tempting to criticize these studies for not using quality-check questions to screen participants. However, against this criticism, we would point out that we restricted participation to high-reputation workers, which has been found to be a sufficient condition for data quality (Peer et al., 2013). Thus, we do not believe our reliance on MTurk samples presents an issue for the quality or validity of our data.

A final concern that might be raised is that we used a similar vignette across the three studies. If the effects observed in Study 1 or Study 2 were driven by a particular aspect of this scenario, and not merely by the consensually nonmonogamous or monogamous relationships that were depicted, then our results might not generalize to other scenarios with the same basic features (or the real world). In response to this concern, we would point out that in addition to the studies presented in this chapter, we have run several other preliminary studies with different vignettes, and in these preliminary studies we obtained findings that were consistent with our hypotheses. We present one of these studies in Section A.5 of the Appendix.

Chapter 3

Zero-Sum Thinking Promotes Non-Cooperation in the Classroom

In the classroom context, students may find themselves in a competition with their peers when "curved" or "norm-referenced" grading procedures are used (Schinske & Tanner, 2014). When these procedures are used, the most desirable grades (A's) are made scarce. For example, at the Loyola University School of Law (Loyola University, 2015), the grading policy states that courses with more than 25 students must be curved such that a maximum of 10% of students receive an A. Thus, in a class of 30 students, only three students will receive the highest mark. Curved grading can be contrasted with "objective" grading procedures, where student work is compared to predetermined standards of quality and the highest grades are technically accessible to all students in the class. For example, at the University of Guelph, an A is defined as: "An outstanding performance in which the student demonstrates a superior grasp of the subject matter, and an ability to go beyond the given material in a critical and constructive manner..." (University of Guelph, 2015).

Curved grading can under some conditions discourage prosocial or cooperative behavior and encourage antisocial or competitive behavior (Crooks, 1988; Deutsch, 1979; Downing, 1994; Johnson et al., 1981; Schinske & Tanner, 2014). This is because of the way curved grading sometimes creates a situation with "negative goal interdependence" (Deutsch, 1949, 2006), wherein a student can succeed by undermining or otherwise not promoting the success of their peers (Downing, 1994). For example, Downing (1994, p. 12) reports anecdotal experience with students who would "steal, multilate, or 'misplace' law books in the

library that were essential to the adequate performance of classmates on papers or exams". Yet, it is important to note that curved grading does not mean that all peer interactions in the classroom present a conflict of interest. Rather, it is more accurate to say that curved grading creates a situation with "mixed-motive interdependence" (Deutsch, 2006), wherein some student-peer interactions are zero-sum and others are not.

Under curved grading, the likelihood that one student's gain will negatively affect another student depends on where each student stands in the class hierarchy. Thus, a crucial factor is status proximity. When two students belong to different but proximal grade categories, then the lower-status student is likely to gain at the expense of their higher-status peer. For example, if A's are reserved for three students in a class of 30, and two students are ranked #3 and #4, then the higher-ranked student might lose their A-level position by cooperating with their lower-ranked peer. But when students belong to relatively distant grade categories, then it is considerably less likely that the higher-status student will suffer a loss by cooperating with their lower-status peer. Along these lines, I argue that individuals might possess a "downward mobility heuristic" which leads them to feel uncomfortable with any situation that could result in their loss of status.

Further, as I discussed in Chapter 1, zero-sum thinking may be understood as a cognitive heuristic. Meegan (2010) obtained evidence of a zero-sum heuristic in a classroom context. In his study, student participants were asked to predict the grade that a target student would receive, using information about grades that had been assigned to other students in the same classroom. In one of his studies, students were also knowledgeable about the previous grades that had been given out, and uncertain about the grading procedures that were used. When the distribution of previously-assigned grades was negatively skewed to indicate that many "A" grades had been given out, participants were less likely to predict that the target student would also receive a high grade, as compared to other distribution conditions, suggesting they had assumed that the availability of desirable grades was limited. Meegan speculated that the zero-sum heuristic might be a cognitive adaptation that facilitates successful intra-group competition for limited resources by serving as a default interpretation of uncertain resource allocation situations.

I would argue that a zero-sum heuristic should also operate when there is certainty about grading (resource allocation) procedures, but *uncertainty* about

peer statuses or ranks. Under such conditions, a student would lack the information necessary to determine whether cooperation might be costly, and thus their judgment should be susceptible to the influence of intuitive processes. As other research has demonstrated, humans generally display a strong tendency for loss aversion (Kahneman & Tversky, 1984) when faced with risky prospects. Thus, the zero-sum heuristic could lead students to assume that cooperation might be costly when faced with uncertainty, and thus to prefer non-cooperation.

3.1 Hypotheses

The studies that follow investigate three main hypotheses that were motivated by the above discussion. First, the *downward mobility heuristic hypothesis* states that individuals should feel uncomfortable with any situation that could result in their loss of status. Second, the *mixed-motive hypothesis* states that rather than uniformly discouraging cooperation in the classroom, curved grading procedures should lead to non-cooperation only when it is likely that cooperation would be costly. Third, the *zero-sum heuristic hypothesis* states that when there is certainty about resource allocation procedures, but *uncertainty* about peer statuses, individuals will leap to the conclusion that peer cooperation might be costly and thus prefer non-cooperation.

3.2 Study 1

This study was previously published in the journal *Social Justice Research* (Burleigh & Meegan, 2013), and is being included "as-is". For this reason, there may be some discrepancies in style, formatting, analytic methods, and theoretical emphasis.

The concepts of justice and fairness are often invoked when an outside force, such as a government, attempts to exert influence over the allocation of resources. Any influence that could result in changes in the relative positions of individuals is considered a threat by those occupying high status positions. Classic examples of this include objections of high income earners to progressive income taxation ("it is unfair to punish the most productive and reward the

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least productive members of society") and to wealth redistribution programs designed to protect at-risk members of society ("it is unfair that some contribute more than they receive and that others receive more than they contribute").

Even those who support progressive taxation and wealth redistribution can usually acknowledge the reasonableness of arguments questioning the fairness of such systems. Arguments for the superiority of these systems over their alternatives tend to emphasize their superior benefits for society as a whole (the "trickle-up effect", see Degnbol-Martinussen & Engberg-Pedersen, 2003, p. 21) rather than their superior fairness. From a social justice perspective, one has to be careful in claiming that objectors have a misperception of these systems as unfair. Indeed, there are several principles by which the fairness of distribution could be judged, such as merit, equality, and need (and the invocation of these principles tends to vary with social status, see Lewin-Epstein & Kaplan, 2003). On the other hand, objectors seem reluctant to set aside claims of injustice in the face of arguments emphasizing broad societal benefits. Why might this be the case? Our research aims to understand why jumping to conclusions of injustice seems to be an intuitive response for some people.

Festinger (1954) posited that people feel a perpetual need to do better and better—that there is a "unidirectional drive upward" (p. 124). A corollary of this is that doing worse (moving downward) should be painful, at least under some conditions. The upward drive motivates individuals to reduce discrepancies that place them in a position of inferiority. When an individual's upward mobility is impossible or insufficient through self-improvement, they may turn to behaviours that interfere with the upward mobility of others, such as sabotage and non-cooperation (Downing, 1994), or collective action (Hoffman et al., 1954). Does the upward drive motivate an aversion to downward mobility, and if so, under what conditions?

It is possible, for example, that people in high status positions will object to any situation that could result in status changes, even if their complaints of injustice could no longer be deemed reasonable. We hypothesize a cognitive heuristic by which people perceive as unfair any situation that could result in downward mobility.

To test this general hypothesis, we examined a situation that was objectively fair, but also capable of resulting in status changes. The people who were affected by the situation were given an opportunity to object, and we report the

characteristics of those who object, the nature of their objections, as well as the characteristics of the situation that lead to objections.

In most modern democratic societies, individual citizens have economic mobility, and governments have the power to implement programs that can affect the mobility or status of individuals. Tapping into perceptions of the justness of such programs is complicated by the fact that the perceptions of individuals are heavily influenced by the biases of the media pundits, and others, from whom they learn of these programs. Although the influence of the media on perceptions of justice is a very important and interesting topic, our goal was to tap into the unbiased perceptions of individuals to novel programs. To this end, university students were asked to share their personal perceptions of a novel program that affected grade allocation. Academic institutions resemble democratic societies in that individual students, like citizens, have mobility and status, and teachers, like governments, have the power to implement programs that can affect the mobility or status of students.

Students in a university course were presented with a program by which a bonus credit, worth the equivalent of one question on the final exam, was available to all students. Objectively, this program might be regarded as fair to all students because all students would receive the same numerical bonus for the same amount of effort. The program was neither a wealth redistribution scheme in which the gain of one student (i.e., raising their grade) came at the cost of another (i.e., lowering their grade), nor was it a progressive attempt to mitigate inequality by targeting the most at-risk students (e.g., those at risk of failing the course). An important aspect of this program was that, although all students would receive the same numerical increase of their final exam grade, there was a possibility that this would not ultimately translate into an increase in their overall course grade. This was due to rounding error, as course grades are rounded to the nearest integer, and the bonus would be insufficient to increase the grades of some students (roughly half of them). Nevertheless, the students were facing a situation in which they could not lose their grade would either get higher or remain the same.

Four novel features of the methodology were central to our goals. First, to facilitate intuitive and unbiased responses, we solicited responses using an open-ended question. Students were not asked to assess the fairness of the bonus program, but instead were asked whether there was "any downside" to the program, and both "yes" and "no" respondents were asked to elaborate. Second, to avoid

a self-serving bias, students were not directly affected by the program they were asked to judge, but instead were told that their assessment could affect whether the program would be implemented in future courses. Third, outcome uncertainty was used to increase the likelihood that students would provide intuitive judgments using other information. Previous studies have found that in the absence of complete information about outcomes, people will use a heuristic to judge fairness using other information that is available, such as procedural information (van den Bos et al., 2001) or moral values (Skitka, 2002). Fourth, a framing manipulation (Tversky & Kahneman, 1981) was used to increase the likelihood that status concerns would influence judgments. There were two framing conditions, each providing an example in which only one of two students ultimately benefited from the program. In the peer-gets-ahead condition, the two students were of equal status before the program acted to differentiate them, and in the inferior-catches-up condition, the two students differed in status before the program acted to equate them. Predictions about the effect of this manipulation are presented below.

Recall that our general hypothesis is that perceptions of injustice will occur for those at risk of downward mobility. This hypothesis leads to specific predictions about the characteristics of those who object, the nature of their objections, and the characteristics of the situation that might produce objections.

Hypothesis 1: High status students would be more likely than low status students to object to the program. When you are on top, there is nowhere to go but down, and when you are on the bottom there is nowhere to go but up. This idiom captures the human appreciation for the fact that change is bad when things are going well and change is good when things are going poorly. The bonus program in the current study had the potential to cause status changes among students, and fairness perceptions might be expected to vary based on status. Among high status students defined as those in the top 10% of the class this potential for change might be perceived as a risk of downward mobility, and among low status students defined as those in the bottom 10% this potential for change might be perceived as an opportunity for upward mobility. Thus, it might be predicted that high status students would be more likely than low status students to object to the program.

This hypothesis emphasizes that negative perceptions about the program are driven by concerns about the potential for downward mobility, which is positively related to status the higher one's status the more one is at risk of downward mobility. There is an alternative possibility, however. Recent research that has assessed the response of individuals to status peers has shown that the level of competitiveness one feels toward a peer is affected by their proximity to a meaningful standard (Garcia & Tor, 2007; Garcia et al., 2006). For example, if being ranked #1 is a meaningful standard, then individuals ranked 3 and 4 tend to behave more competitively toward one another than individuals ranked 23 and 24. Interestingly, though, if it is known that there are only 25 positions, and it is meaningful to avoid ending up in last place, then individuals ranked 23 and 24 can also behave quite competitively toward one another; more competitively, for example, than those with a ranking that is intermediate to the high and low standards (e.g., 13 and 14).

Note the parallels to our study because our framing conditions prime students to consider two closely "ranked" students. In addition, there are both high and low standards in a university course, as there are students who get the highest and lowest grades, and this information is made available to students in the form of range and frequency distribution information following exams. One might predict, then, that low status students would object to the program on the basis that it has the potential to affect their ability to avoid last place. To test for this possibility, we examined how both high and low status students compared to students of intermediate status.

Hypothesis 2: Objections would question the fairness of the program. Research on the fair process effect suggests that procedural fairness can have a positive influence on fairness judgments even in the face of distributive inequity (Folger et al., 1979; Hagedoorn & Buunk, 1998). In the current study, students were not told to assess the fairness of the program, nor were they directed to assess the distributive or procedural aspects of the program. Rather, the responses we solicited were open-ended. We thus anticipated at least two possible types of objections. The first would emphasize the potential for distributive inequity, and the second would question the procedural fairness of the program by questioning, for example, why merit was not the basis for determining the ultimate beneficiaries.

Hypothesis 3: A high status student would feel most threatened when reminded that a high status peer could benefit more from the program. We

predicted that objections would be more likely in the peer-gets-ahead than the inferior-catches-up condition, for the following reasons. The idiom *keeping up with the Joneses* captures the phenomenon whereby people feel compelled to maintain equal status with their economic peers by acting to match the resource acquisitions of those peers. When an outside force creates a status imbalance, the party that does not benefit will feel threatened. Imagine that you are a suburbanite whose neighbor often receives barely-used luxury items from her affluent parents. The two-year-old BMW she received puts your five-year-old Infiniti to shame, and things would not improve if your modest parents offered to pass along their ten-year-old Chevrolet. Because the resulting status imbalance was due to the actions of an outside entity rather than the superior effort or talent of one party, it is natural to perceive the situation as unjust. The peer-gets-ahead condition draws attention to the possibility that the bonus program can create a status imbalance among students who were considered equal without the bonus. Thus, we expected some students in this condition to question the fairness of the program.

Returning to our hypothetical suburban neighborhood, imagine that you recently earned a major promotion at work and decided that it was time to buy that BMW that you have always wanted. This creates a status imbalance in which you are ahead of your neighbors. How might you react when your neighbor receives her BMW from her wealthy parents? This scenario is less likely to make you feel threatened, and therefore less likely to invoke the feeling that an injustice had occurred. The inferior-catches-up condition draws attention to the possibility that the bonus program can create a status balance among students who were considered unequal without the bonus. We expected comparatively fewer students in this condition to question the fairness of the program.

3.2.1 Method

The following situation was presented to a class of 566 undergraduate students on the last page of their final exam:

> A message from the instructor:
>
> I like to give students in my courses bonus opportunities when I am able. I look at this practice as making up for minor mistakes I

might have made, such as inadvertently including a poorly-worded question on an exam. I plan to do the following in this course...

Everyone who answers the question below will receive a bonus worth the value of one question on this exam. If you do the math (see below), it means that everyone's final grade will increase by 0.567%...

1 question / 75 questions = 1.33% bonus on final exam
Final exam = 42.5% of final grade
1.33% x 42.5% = 0.567% bonus on final grade

Because grades on your transcript are rounded to the nearest integer (e.g., anything from 69.500 to 70.499 is treated as a 70), a bonus is only meaningful if it bumps your grade to the next highest integer. With a bonus of 0.567%, only about half of you will actually benefit.

Note that there is no way of knowing whether you will be one of the lucky ones who benefits, because you don't know the results of this exam, and thus there is no way for you to know what your final grade turns out to be.

In the space below, I would like you to share your opinion about whether there is any downside to this plan (your responses will determine whether I continue this practice in future semesters). You will only be eligible for the bonus marks if you share a meaningful opinion (i.e., something more than just 'yes' or 'no'). There is no right or wrong answer.

In the peer-gets-ahead condition, the following information was presented after the statement "only about half of you will actually benefit":

For example, a person who gets a final grade of 69.0 will jump from a 69 to a 70 (69.0 + 0.567 = 69.567 = 70), but a person who gets a final grade of 68.9 will stay at 69 (68.9 + 0.567 = 69.467 = 69).

In the inferior-catches-up condition, the following information was presented instead:

> For example, a person who gets a final grade of 69.0 will jump from a 69 to a 70 (69.0 + 0.567 = 69.567 = 70), but a person who gets a final grade of 69.9 will stay at 70 (69.9 + 0.567 = 70.467 = 70).

At this university, A+ = 90-100, A = 80-89, B = 70-79, C = 60-69, D = 50-59, and F = 0-49. Using examples at the border between B and C was intentional, as these examples were closest to the average grade for the class (70%), and thus was directly applicable to the largest proportion of students. It was assumed, however, that students elsewhere in the grade range (e.g., near the border between A+ and A) would mentally translate the example to their circumstances.

A total of 545 students responded to the question out of the 566 students who were given the opportunity (96%). It is assumed that 21 students (4%) did not respond because they were unaware of the bonus question, despite the fact that it was advertised on preceding pages containing exam questions. Time pressure was ruled out as a factor because all students turned in their exams before the end of the exam session. Random assignment of students to conditions was ensured by placing exams with each condition in alternating seats in an examination room where students choose their own seat. 274 students received the peer-gets-ahead condition, and 271 students received the inferior-catches-up condition. High status students (top 10% of class) received an 85% or higher in the course and low status students (bottom 10%) received 55% or lower.

The written responses were transcribed and coded for the presence of objections on the basis of distributive and/or procedural injustice, by determining whether students referred to outcomes and/or processes in their response. Coding was performed separately by both authors. At the time of coding, authors were blind to respondents' condition, grade, and status. Inter-rater reliability was examined and found to be acceptable for all coding categories; inter-rater agreement was 97% or greater, and an analysis using the Kappa (κ) statistic (Cohen, 1960) was also found to be acceptable (all κs $>= .79$) according to conventional standards (Landis & Koch, 1977). Where there was disagreement about the coding of responses a consensus was reached by authors. Chi-square (χ^2) analyses were used to test our predictions about the frequency of objections, and phi (ϕ) is reported as a measure of effect size; as phi is essentially a correlation coefficient, Cohen (1988) rule of thumb can be used for interpretation: small = .1, medium = .3, and large = .5.

3.2.2 Results

As expected, some responses questioned the distributive fairness of the program by lamenting the fact that only some students would ultimately benefit. The following was representative of such a response: "I feel like the bonus should be slightly higher so that everyone will benefit from it—it seems unfair that only about half will." Other responses questioned the procedural fairness of the program by questioning why luck, and not merit, was the basis for determining the ultimate beneficiaries. The following was representative of such a response: "I think there is a tremendous downside because my knowledge presented and studied for this exam does not affect whether or not I will get a free mark, that someone else might purely based on luck." A third type of response was also categorized as questioning the procedural justice of the program; this type questioned the fairness of a procedure whereby a person could make the effort to complete the bonus question without receiving the reward of an ultimate benefit. The following was representative of such a response: "It may not be the most fair method of a bonus mark as those who put in effort may not be rewarded though they deserve it."

Of the 545 respondents, 118 (22%) questioned the distributive and/or procedural fairness of the program, with 81 (15%) questioning distributive fairness and 58 (11%) questioning procedural fairness. As predicted, framing condition had a significant impact on the frequency of injustice claims: objections were far more frequent ($\chi_1^2 = 120.05, N = 545, p < .001, \phi = .47$) in the peer-gets-ahead condition (112 of 274, or 41%) than in the inferior-catches-up condition (6 of 271, or 2%). Given this result, the remaining analyses only compared students within the peer-gets-ahead condition.

Of the remaining 274 students, there were 33 students from the top 10% of the class (i.e., high status), 39 students from the middle 10% of the class (i.e., intermediate status), and 31 students from the bottom 10% of the class (i.e., low status). As predicted, there were more ($\chi_1^2 = 6.61, N = 64, p = .01, \phi = .32$) objections from high status students (19 of 33, or 58%) than from low status students (8 of 31, or 26%). When high and low status groups were defined instead based on the top 50% and bottom 50%, the same pattern was observed— there were more ($\chi_1^2 = 10.80, N = 274, p = .001, \phi = .20$) objections from high status students (64 of 124, or 52%) than from low status students (48 of 150, or 32%). As predicted, a linear increase in objections across status groups was observed, such that the frequency of objections from intermediate status

students (15 of 39, or 38%) was greater than low status students and less than high status students, as confirmed by an ordinal chi-square test ($\chi_1^2 = 6.35, N = 103, p = .01$).

Another interesting question concerned whether high and low status students would differ in the nature of their objections, with respect to distributive and procedural injustice. Responses questioning distributive fairness were more frequent ($\chi_1^2 = 8.11, N = 64, p = .004, \phi = .36$) among high status (15 of 33, or 45%) than low status (4 of 31, or 13%) students, but responses questioning procedural fairness did not differ ($\chi_1^2 = 0.02, N = 64$) between high status (8 of 33, or 24%) and low status (8 of 31, or 26%) students. A linear trend was also observed in the frequency of responses questioning distributive fairness across status groups, such that responses from intermediate status students (6 of 39, or 15%) were more frequent than among low status students and less frequent than among status students, as confirmed by an ordinal chi-square test ($\chi_1^2 = 8.55, N = 103, p = .003$). An omnibus chi-square revealed that intermediate status individuals did not differ from either low or high status individuals with respect to responses questioning procedural fairness ($\chi_1^2 = 1.36, N = 103$). The fact that status was linearly related to concerns about ends (distributive) than means (procedural) is consistent with the hypothesis that status increases feelings of threat associated with a risk of downward mobility, which results from differential outcomes among peers.

3.2.3 Discussion

In summary, we solicited student opinions of a bonus program by which grades for some would increase and grades for others would remain the same. The majority of students (78%) responded favorably to the program, although this number was affected strongly by how it was framed, with 98% approval in the inferior-catches-up condition and 59% approval in the peer-gets-ahead condition. The objections in the latter condition were most frequent among high status students, who, we argue, were implicitly uncomfortable with the possibility that their status could decrease relative to some of their high-status peers. Explicitly, their objections used the language of social injustice, especially claims of distributive unfairness. We argue that these perceptions of injustice are a cognitive manifestation of an aversion to any situation that could lower one's status.

The ineffectiveness of the inferior-catches-up frame at inducing perceptions of injustice was interesting, and perhaps even counterintuitive. One might have predicted, for example, that more students would have been bothered by the possibility that final grades did not distinguish between a student who earned a 69.9% and a student who earned a 69.0%. At least in this context, people found it a greater injustice when two equal people were treated unequally than when two unequal people were treated equally. Perhaps people are particularly wary when the Joneses get ahead and comparatively less wary when they are playing the role of the Joneses.

This is not to say that perceptions of injustice will never arise in those of superior economic status when an outside force acts to level the playing field. For example, superiors might be expected to perceive the mitigation of inequality as unjust when the absolute gains of inferiors come at absolute cost to superiors (i.e., taking from the rich to give to the poor). In the current study, the gains of some students did not come at the cost of others. Another factor is the scope of the program. If the scope is narrow because status changes are relatively small, as with the bonus in the current study, then it would only be expected to induce status threat among peers of similar status. A third factor is whether the scale of competition (West et al., 2006) for comparison is local, in which case status-peers are the primary competitors, or global, in which case everyone is a potential competitor. Comparison tends to be local, for the following reasons. First, for geographic and social reasons, people are more likely to interact with status-peers than with inferiors or superiors. Second, if several people are competing for a limited resource, such as a job, then they are most likely to be in a competition with status-peers than with inferiors or superiors. Because threats from inferiors are not salient when comparison is local, it is not surprising that the inferior-catches-up condition did not induce perceptions of injustice.

Some students questioned the fairness of program on the basis that the procedure for determining the ultimate beneficiaries used an arbitrary decision criterion (i.e., luck or chance). It is important to point out that this was not an accurate interpretation of the situation. The decision criterion inherent to the bonus program was based on merit—all students who completed the question received the same bonus. The resulting distributive inequity was, in fact, a fault of the rounding procedure that was inherent to the university's grading system. Moreover, the bonus actually corrected for the rounding error already present in the grading system. In other words, those that benefited from the bonus were those that would have lost points from rounding error, and those that did not benefit

from the bonus were those that would have gained points from rounding error. For example, a student with a 78.3% stood to lose 0.3% from rounding down to 78%, and a student with a 77.7% stood to gain 0.3% from rounding up to 78%; the bonus simply maintained their relative position, with the former receiving a deservedly higher grade (79%) than the latter (78%). Nevertheless, because the students were asked to judge the bonus program and not the university's grading system, we were not surprised that some students blamed the bonus program for the seemingly arbitrary manner in which beneficiaries were determined.

We suggest that our findings provide evidence for a cognitive heuristic that is activated whenever one's status is threatened. When an outside force takes an action that threatens one's status, this heuristic leads to a perception of injustice, which presumably functions to motivate an overt objection on the basis of fairness. A related heuristic, called the zero-sum heuristic, is activated in response to the gains of others, and leads to the perception (and sometimes misperception) that those gains come at personal expense, as in a zero-sum game (Meegan, 2010).

We suggest that objections to the program were driven by concerns about the potential for downward mobility, which grows in relation to one's status. Nevertheless, it was surprising that low status students were not inspired to object to a program that could affect their risk of having one of the lowest grades in the class. Why was proximity to standards not a factor in our study? The most likely explanation is that rankings and standards were not made explicitly available to our students as they were in the research that has demonstrated the effects of proximity to both high and low standards (Garcia & Tor, 2007; Garcia et al., 2006). Under such uncertain conditions, people are likely to defer to fast and frugal heuristics that, in this case, are more likely to be activated in those at risk of downward mobility. An alternative explanation, which would be difficult to rule out without further investigation, is that students acted as if there was only one standard, and it was on the top end of the grade scale. In other words, the fact that objections were most prevalent among high students, of intermediate prevalence among intermediate students, and least prevalent among low students could be because of the corresponding distance from a high standard.

One might argue that the magnitude of the bonus was too small to result in any meaningful changes in status. From an outsider's perspective, this may indeed be true. But for those directly affected, it pays off in the long run to be on guard against even the smallest of threats to one's status. Heuristics are

"fast and frugal" mental shortcuts thought to be invoked quickly and with minimal computation, that facilitate making inferences about the world when time and knowledge are constrained (Gigerenzer & Goldstein, 1996; Gilovich et al., 2002). For example, the hypothesized heuristic might compute the existence of a status threat without also assessing the magnitude of that threat. On the other hand, this magnitude factor might explain why objections to the bonus system were not universal among high status students. In other words, if the threat is smaller, then it might be easier to overcome the tendency to object to the source of the threat. The bonus was also presented in such a manner that knowledge about outcomes was uncertain, and so the heuristic might have computed the worst possible outcome (i.e., no personal benefit, but others benefit). This worst possible outcome might then be an instance of upward social comparison, particularly in the inferior-gets-ahead condition, which is known to produce negative valence among individuals for whom the performance dimension is relevant to their self-definition (Garcia et al., 2010; Tesser, 1988). As it would be expected that high performers in a university would be more likely to align their self-definition with academia and derive self-esteem from their academic performance, this could also help explain why high status students were more likely to feel threatened and object to the bonus plan. In this way, status-seeking and maintenance might also be propelled by a positive self-evaluation motive. This account would be consistent with recent findings that fairness matters more to people when their selves have been threatened (Miedemam et al., 2006).

Although there was considerable outcome uncertainty, it is important to clarify whether students placed judgment on the program from behind a veil of ignorance (Rawls, 1971). Students were ignorant about whether they would be one of the ultimate beneficiaries of the bonus program. On the other hand, students knew their status relative to their fellow students when judging the situation. Thus, unlike the traditional conception of the veil where personal characteristics would be unknown, students knew their position in the hierarchy, and because their status would presumably have determined whether there was a potential downside, it follows that there should not have been universal agreement about the fairness of the program.

Our analyses focused on the prevalence of unfairness judgments, which characterized 22% of responses. But what of the remaining students—did they experience a contrary perception of justice—one that led them to judge the bonus program as fair? Of these remaining students, only 7% (32 of 427) described

the program as fair. This suggests that most students who approved of the program were not doing so because of its fairness, and thus were not experiencing a contrary perception of justice. We suggest instead that intuitive perceptions of justice only occur for those who are at risk of downward mobility, and that fairness does not spontaneously come to mind for those who are not.

3.3 Study 2

In this study, participants were presented with classroom vignettes in which grading procedures (curved or noncurved) and status-proximity (proximate or distant) were both manipulated. After reading the vignette, participants were asked to report their willingness to cooperate with a peer by sharing their lecture notes from an important lecture that the peer had missed but which they had attended.

The mixed-motive hypothesis states that individuals should be less willing to cooperate with a peer when cooperation is likely to be costly. Based on this hypothesis, I generated two predictions: 1) under curved grading participants would be less cooperative with a peer whose status was proximate to their own, as compared to a peer whose status was much lower than their own; 2) under noncurved grading participants would be cooperative with a peer regardless of peer status.

3.3.1 Method

3.3.1.1 Participants

In all, 234 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during August 2015. Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 95%. The sample was relatively well-educated and relatively equally represented by women and men (97 women, 137 men; $M_{age} = 35.66, SD_{age} = 11.90$; 130 had completed post-secondary education, 102 had completed high-school or a GED equivalent, and 2 did not answer the education question). Participants were compensated with $0.75 USD, and the survey took approximately 5-8 minutes to

complete. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#15OC014).

3.3.1.2   Materials and Procedure

Participants were randomly assigned to read a vignette that described a classroom scenario. They were asked to imagine being a university student, that they were motivated to get a scholarship, and that in order to receive a scholarship they would need to score 90% or better on their next exam. The first experimental manipulation was the grading procedure that the professor was stated to have used in the course (curved grading or noncurved grading). The following text was used:

> **Curved grading.** In this course, the instructor uses curved grading. Grades are assigned by ranking each student relative to their peers, which means the grade that one student receives can affect the grades that other students receive. In this class of 100 students, only 10 will receive a grade of 90% or better (the students who are ranked #1 to #10); the majority of students (70) will receive a grade in the B or C ranges (70 to 89%); and the remaining students (20) will receive a grade in the D or F ranges (0 to 69%). In other words, this course is a competition among students for a limited number of high grades.

> **Noncurved grading.** In this course, the instructor does not use curved grading. Instead grades are determined based on student performance, which means the grade that one student receives cannot affect the grades that other students receive. All students who answer 100% of the questions correctly on the exams receive a grade of 100%; students who get 90% correct receive a grade of 90%; etc... In other words, this course is not a competition among students for a limited number of high grades.

Participants were informed that they were preparing to take the final exam for their last course of the semester, which would determine whether or not they received a scholarship. In this course, the professor provided a special lecture to help students prepare for the final exam, which students in the past had reported to be beneficial. But, as the final exam drew near, a flu outbreak occurred on

campus and many students missed the pre-exam lecture due to sickness. Participants learned that they attended this lecture, and that they are an excellent note-taker. It was stated that one student in the class who missed the pre-exam lecture was interested in borrowing their notes. Finally, the second experimental manipulation to present the student-peer statuses as being proximate or distant. The following text was used:

> **Proximate status.** One student who missed the pre-exam lecture wants to know if they can borrow your notes for studying. This student has been performing well in the course so far. On the midterm, they did slightly better than you did (CURVED GRADING: they are ranked #11, whereas you are ranked #12 // NONCURVED GRADING: they received an 89%, whereas you received an 88%). If this student had your notes to help them study for the final exam, they might get a higher grade than you.

> **Distant status.** One student who missed the pre-exam lecture wants to know if they can borrow your notes for studying. This student has been struggling with the course so far. On the midterm, they did much worse than you did (CURVED GRADING: they are ranked #57, whereas you are ranked #12 // NONCURVED GRADING: they received a 53%, whereas you received an 88%). If this student had your notes to help them study for the final exam, they might not fail the course.

Thus, the two experimental manipulations consisted of whether the professor used curved or noncurved grading, and whether the status of the participant's peer was proximate or distant to their own. The dependent variable was participants' willingness to cooperate with that peer. Specifically, participants were asked "How willing are you to share your notes with this student?" and provided a 7-point interval rating scale that ranged from "Not at all willing" to "Extremely willing".

3.3.2 Results

To determine if cooperative tendencies differed between the conditions, a univariate Analysis of Variance (ANOVA) was performed, in which grading procedures (Curved or Noncurved) and status-proximity (Proximate or Distant) were

Table 3.1: Sample sizes, means, and standard deviations.

Grading	Status	N	Mean	SD
Curved	Proximate	61	3·79	1·86
	Distant	56	5·13	1·83
Noncurved	Proximate	60	6·18	1·13
	Distant	57	5·81	1·45

entered as predictors of willingness to cooperate. Where omnibus tests were statistically significant, t-tests were performed to identify the effects. Partial eta-squared and Cohen's *d* were calculated to estimate effect sizes for any statistically significant effects.

The ANOVA revealed a significant interaction between Grading and Status $(F(1, 230) = 16.56, p < .001, \eta_p^2 = .07)$, and a significant main effect of Grading $(F(1, 230) = 60.53, p < .001, \eta_p^2 = .20)$. Cooperativeness was lower in Curved-Proximate than Curved-Distant $(t(114.47) = -3.92, p < .001, \eta_D = 0.73)$, and did not differ between the Noncurved-Proximate and Noncurved-Distant conditions $(t(105.90) = 1.57, p = .241)$. See Table 3.1 for a summary of sample sizes, means, and standard deviations. See Section B.1 in the Appendix for a summary of diagnostic tests.

3.3.3 Discussion

This experiment was designed to test the mixed-motive hypothesis, which states that individuals should be less willing to cooperate with a peer when cooperation is likely to be costly.

To test this hypothesis, I manipulated the grading procedures (curved or non-curved) and status-proximity (proximate or distant) of the peer with whom the participant was asked to consider cooperating. Participants were asked to rate their willingness to cooperate with this peer by sharing their notes from a pre-lecture exam that they attended but their peer had missed.

Willingness to cooperate was compared between the conditions, and it was found to be lower with proximate vs. distant status under curved grading, but equal in the noncurved conditions. Thus, consistent with the mixed-motive hypothesis, participants appear to have adjusted their willingness to cooperate based on the perceived risk that cooperation might benefit the peer at their own expense. This finding is consistent with previous work on how status proximity affects students' evaluations of resource allocations (Burleigh & Meegan, 2013).

3.4   Study 3

The *zero-sum heuristic hypothesis* states that when there is certainty about resource allocation procedures, but *uncertainty* about peer status, individuals will leap to the zero-sum conclusion that peer cooperation would be costly. Based on this hypothesis, I predicted that under curved grading, participants would be less willing to cooperate with a peer when they are uncertain about peer status because there would be some chance that cooperation would be costly, as compared to when they know that a peer is much lower in status compared to themselves.

I also had competing secondary predictions about how, under curved grading, cooperativeness would compare between the uncertain status and proximate status conditions. A strong zero-sum bias would suggest that levels of cooperativeness should be similarly low in both conditions. A weak zero-sum bias would suggest that cooperativeness should be higher with uncertain status than with proximate status, because some individuals might leap to the zero-sum conclusion that uncertain status is risky and others might leap to the nonzero-sum conclusion that it is not. Therefore, on average, under curved grading, cooperativeness with uncertain status might be at an intermediate level between the proximate and distant status conditions, and this intermediateness might reflect the presence of two opposing response tendencies.

The methods used in this experiment were identical to Study 2, except for the addition of an uncertain status condition.

3.4.1 Method

3.4.1.1 Participants

In all, 180 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during January 2016. Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 95%. A script was used to ensure that none of the participants had participated in the previous studies. The sample was relatively well-educated and relatively equally represented by women and men (92 women, 88 men; $M_{age} = 34.24, SD_{age} = 11.01$; 118 had completed post-secondary education, 61 had completed high-school or a GED equivalent, and 1 did not answer the education question). Participants were compensated with $0.50 USD, and the survey took approximately 5 minutes to complete. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#15OC014).

3.4.1.2 Materials and Procedure

Participants were randomly assigned to read a vignette that described a classroom scenario. The scenario from Study 2 was used for this experiment. Two aspects of the scenario were manipulated. First, course grading was either: 1) curved, or 2) noncurved. Second, the peer with whom the participant was asked to share their notes was either: 1) proximate in status, 2) distant in status, or 3) the peer's status was stated to be unknown to the participant. This new unknown-status text was presented as follows:

> One student who missed the pre-exam lecture wants to know if they can borrow your notes for studying. You don't know how well this student has been performing in the course so far, but you are doing pretty well yourself — almost well enough to receive a scholarship (CURVED GRADING: you are currently ranked #12 in the class // NONCURVED GRADING: on the mid-term you received an 88%). However, you do know that if this student had your notes to help them study for the final exam, they would certainly perform much better than if they didn't have your notes.

Thus, there were a total of six experimental conditions. The dependent variable measured participants' willingness to cooperate with the peer. Specifically, participants were asked "How willing are you to share your notes with this student?" and provided a 7-point interval rating scale that ranged from "Not at all willing" to "Extremely willing".

3.4.2   Results

To determine if cooperative tendencies differed between the conditions, a univariate Analysis of Variance (ANOVA) was performed, in which grading procedures (Curved or Noncurved) and status-proximity (Proximate, Distant, or Uncertain) were entered as predictors of willingness to cooperate. Where omnibus tests were statistically significant, simple main effects tests and t-tests were used to identify the effects. Partial eta-squared and Cohen's *d* were calculated to estimate effect sizes for any statistically significant effects.

The ANOVA test revealed a significant interaction between Grading and Status ($F(2, 174) = 12.35, p < .001, \eta_p^2 = .11$), as well as significant main effects of Grading ($F(1, 174) = 34.07, p < .001, \eta_p^2 = .16$) and Status ($F(2, 174) = 6.40, p = .002, \eta_p^2 = .10$). Next, I performed a simple main effects test to compare the Status-within-Grading conditions.

First, in the Status-within-Curved conditions the simple main effect was significant ($F(2, 87) = 17.17, p < .001, \eta_p^2 = .25$). In the Status-within-Noncurved conditions the simple main effect was not significant ($F(2, 87) = 1.57, p = .213$).

To follow-up on the significant simple main effect with Status-within-Curved conditions, I performed three one-tailed t-tests to examine my *a priori* predictions that: 1) Curved-Proximate would elicit the lowest level of cooperativeness, 2) Curved-Distant would elicit the highest level of cooperativeness, and 3) Curved-Uncertain would elicit an intermediate level of cooperativeness. In other words, I expected to find Curved-Proximate < Curved-Uncertain < Curved-Distant.

As predicted, cooperativeness was lower in Curved-Proximate than Curved-Distant ($p < .001$), marginally lower in Curved-Proximate than Curved-Uncertain ($p = .067$), and lower in Curved-Uncertain than Curved-Distant ($p = .005$); all differences were large ($ds > 0.50$). See Table 3.2 for a summary of mean ratings

Table 3.2: Sample sizes, means, and standard deviations.

Grading	Status	N	M	SD
Curved	Proximate	30	3·30	1·82
	Distant	30	5·83	1·51
	Uncertain	30	4·33	2·07
Noncurved	Proximate	30	6·10	1·00
	Distant	30	5·93	1·44
	Uncertain	30	5·50	1·53

Table 3.3: One-tailed Student's t-tests.

Comparison	t	df	p	D
Curved-Proximate vs. Curved-Distant	−5·86	56·07	<·001	1·51
Curved-Proximate vs. Curved-Uncertain	2·05	57·06	·067	0·53
Curved-Distant vs. Curved-Uncertain	−3·20	99·03	·005	0·83

and standard deviations, and Table 3.3 for a summary of t-tests. See Section B.2 in the Appendix for a summary of diagnostic tests.

Given this finding of intermediateness with ratings in the Curved-Uncertain grading condition, I was interested in determining whether the underlying distribution of ratings reflected: 1) a unimodal distribution centered around an intermediate level of cooperativeness, or 2) a bimodal distribution indicating the presence of both high and low ratings of cooperativeness.

To assess the underlying distribution, a histogram of the ratings was generated. A visual assessment of this histogram, Figure 3.1, suggests the presence of two modes at the extremes of the scale, with relatively few ratings near the mid-point of the scale.

(a) Proximate Status

(b) Distant Status

(c) Uncertain Status
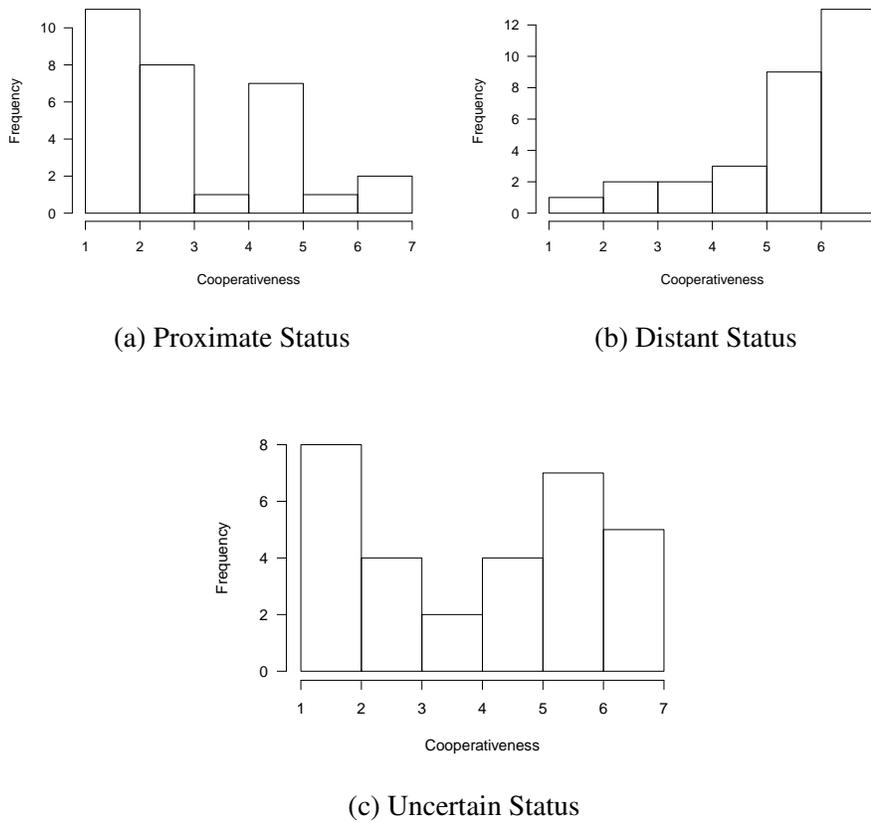
Figure 3.1: Histograms of ratings in the Curved grading conditions.

In sum, these results replicated those of Study 2, providing further support for the mixed-motive hypothesis. Moreover, these results were also consistent with the zero-sum thinking hypothesis. Finally, a bimodal distribution of ratings was observed in the Curved-Uncertain condition, which seems to indicate the presence of opposing response tendencies.

3.4.3 Discussion

This study was designed to test the zero-sum heuristic hypothesis, which states that when there is certainty about resource allocation procedures, but *uncertainty*

about peer status, individuals will leap to the zero-sum conclusion that peer co-operation would be costly.

I used the same scenario and experimental procedure as in Study 2, with the addition of an uncertain status condition in which it was stated that the peer's status was unknown to them. Consistent with the zero-sum heuristic hypothesis, cooperativeness was lower under curved grading when participants were uncertain about the peer's status than when they were certain that the peer's status was distant to their own. As well, cooperativeness was higher under curved grading with uncertain status as compared to proximate status. Thus, cooperativeness was at an intermediate level under curved grading in the uncertain status condition. The intermediateness of ratings under curved grading with uncertain status reflected a bimodal distribution of ratings with a mode located at each of the two extremes of the scale. I would suggest that this finding might indicate that some individuals intuitively judged the situation to be zero-sum, whereas others intuitively judged it to be nonzero-sum, consistent with a weak zero-sum bias.

3.5   Study 4

In the previous study, a bimodal distribution of responses was observed under the condition of peer status uncertainty. I suggested that this distribution might reflect individual differences in zero-sum thinking—that while a number of individuals had intuitively judged the situation to be zero-sum, a similar proportion had judged it to be nonzero-sum.

In the literature, different responses to uncertain resource allocations have been observed between individuals of different Social Value Orientations (SVOs) (Cornelissen et al., 2010; de Dreu & Boles, 1998; de Kwaadsteniet et al., 2006; Roch & Samuelson, 1997), and these orientations have previously been linked to zero-sum intuitions by at least one study (de Dreu & Boles, 1998). In this present study, I examine SVOs as a possible trait to explain different responses to the uncertain classroom scenario.

SVOs reflect individuals' most valued outcomes from a resource allocation situation, where value is defined both in terms of the subjective likelihood and the utility of possible alternatives (McClintock, 1972). SVO measures are use to classify individuals into categories like *prosocial*, *competitive*, *altruistic* and *individualistic* (McClintock & Allison, 1989; Van Lange, 1999; Van Lange et

al., 2007); and these categories are often reduced to "proself" and "prosocial". Proself individuals tend to prefer an allocation that maximizes their own share of a resource (irrespective of, or relative to, other individuals), whereas prosocial individuals tend to prefer an allocation that is most egalitarian or which maximizes the joint share. SVOs have been found to predict behavior in numerous interdependent situations, both in laboratory and field studies (Balliet et al., 2009; Bogaert et al., 2008).

Importantly, the usefulness of SVO as a predictor of behavior appears to depend on resource certainty, as studies have found that individuals of different orientations behave similarly when they have certain resource knowledge, but behave differently (in line with their orientations) when they are uncertain (Cornelissen et al., 2010; de Dreu & Boles, 1998; de Kwaadsteniet et al., 2006; Roch & Samuelson, 1997). For example, de Kwaadsteniet et al. (2006) found that when individuals were certain about the size of a resource, they used an equal division rule; but when individuals were uncertain about the size of a resource, proselfs kept more of the resource for themselves. Similarly, Cornelissen et al. (2010) found that under cognitive load, prosocials behaved more generously than proselfs in a dictator game; but when cognitive resources were available prosocials and proselfs behaved similarly. Supporting the link between a proself orientation and zero-sum intuitions, de Dreu & Boles (1998) found that proselfs were predisposed to use, value, and recall competitive heuristics. In one study, they created a list of heuristics which they classified as competitive (e.g., "your loss is my gain," "winner take all," and "never trust your opponent"), neutral (e.g., "time is money," "the goal justifies the means," and "be well prepared"), or cooperative (e.g., "share and share alike," "always give others the benefit of the doubt," and "be willing to compromise"). They asked participants to read a negotiation scenario involving a used car, and instructed them to make the first offer as a potential buyer. Afterwards, participants read the list of heuristics, and indicated the ones they had used when making their offer, as well as the ones they thought were generally most effective in negotiations. Proselfs selected more competitive heuristics, and rated them as more effective; whereas prosocials selected more cooperative heuristics, and rated them as more effective. In a second study, participants were given a list of heuristics to read and think about prior to the negotiation. After the negotiation, they were asked to list as many as they could remember. Prosocials remembered more cooperative heuristics than competitive heuristics, whereas proselfs remembered more competitive heuristics than cooperative heuristics.

Based on these findings, I consider here the possibility that the zero-sum heuristic might be a trait of the proself orientation but not the prosocial orientation. I refer to this as the *trait zero-sum heuristic* hypothesis. To test this hypothesis, I used the same classroom scenario as Study 2, and I measured participants' SVOs using the SVO Slider Measure (Murphy et al., 2011). I predicted that uncertain peer status would elicit less cooperation from proselfs than prosocials, because proselfs would be more likely to assume that the peer's gain would be their loss; whereas certain peer status would elicit similar levels of cooperation or non-cooperation from prosocials and proselfs.

3.5.1   Method

3.5.1.1   Participants

In all, 226 individuals from the United States were recruited from Amazon's Mechanical Turk (www.mturk.com) during April 2016. Qualifications were used to ensure high-quality data; individuals could not participate unless they had completed at least 100 MTurk tasks with an approval rate of at least 98%. A script was used to ensure that none of the participants had participated in the previous studies. The sample was relatively well-educated and relatively equally represented by women and men (123 women, 101 men, and 2 transgender; $M_{age} = 34.68, SD_{age} = 12.14$; 138 had completed post-secondary education, 59 had completed high-school or a GED equivalent, and 21 did not answer the education question). Participants were compensated with $0.50 USD (with the opportunity for a lottery bonus, described below), and the survey took approximately 5 minutes to complete. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#15OC014).

3.5.1.2   Materials and Procedure

The same scenarios were used as in Study 2 and Study 3.[1]

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[1]In Study 4, several participants had mentioned in an open-ended feedback question that their responses were influenced by the wording of the note-sharing question. Specifically, they mentioned a concern that sharing their notes with the other student might mean that they would

Immediately following the scenario, participants responded to two recall questions about the scenario, in order to check their attention and comprehension. First, they were asked what kind of grading the instructor used ("uses curved grading", "does not use curved grading" or "I don't recall"). Second, they were asked how the peer with whom they were asked to cooperate performed on the mid-term relative to themselves ("slightly better...", "much worse...", "neither, it didn't say" or "I don't recall").

After responding to the recall questions, participants completed the 6-item version of the SVO Slider Measure (Murphy et al., 2011).[2] This scale provides a continuous score that ranges from -16.26 to 61.39, where a higher score reflects a stronger prosocial orientation and a lower score reflects a stronger proself orientation. To increase the realism of this task, a lottery was used such that one in 20 participants would actually receive the amounts that they allocated to themselves; and another anonymous MTurk worker would receive the amounts that the decision-maker allocated to "other". This lottery procedure was also used by Murphy et al. (2011). Finally, participants were asked about their age, sex, and highest level of education completed, provided with an opportunity to comment on the study, and debriefed.

3.5.2 Results

Prior to the analyses, I examined participant accuracy on the recall questions. Overall, 83% of participants answered all recall questions correctly. All participants were retained in the analyses, except for two participants who were removed because they reported technical problems with the SVO Slider Measure. Of the 225 participants in the sample, 56% (126) were prosocial and 44% (99) were proself. These proportions are similar to previous studies (Balliet et al., 2009; Murphy et al., 2011).

The primary analysis tested the zero-sum trait hypothesis, which assumes that the zero-sum heuristic is a trait unique to proself individuals. If this is the case, then the uncertain peer status should elicit less cooperation from proselfs

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not have these notes to study for the exam. Therefore, to avoid this interpretation in the present study, participants were instead asked how willing they were to share a *copy* of their notes.

[2]Here, I used the source code for a web-based implementation of the measure that Dr. Murphy has made available on the Decision Science Laboratory website (vlab.ethz.ch).

than prosocials; whereas certain peer statuses (proximate and distant) should elicit similar levels of cooperation or non-cooperation.

To test these predictions, a univariate Analysis of Variance (ANOVA) was performed, in which Status (Proximate or Distant), SVO (proself or prosocial), and the Status*SVO interaction, were all entered as predictors of willingness to cooperate. Where omnibus tests were statistically significant, post-hoc tests were performed using t-tests. Partial eta-squared and Cohen's d were calculated to estimate effect sizes for any statistically significant effects.

The ANOVA revealed a significant main effect of Status ($F(2, 219) = 12.23$, $p < .001, \eta_p^2 = .09$), and a significant main effect of SVO ($F(1, 219) = 6.35, p = .013, \eta_p^2 = .03$). However, the Status*SVO interaction was not significant ($F(2, 219) = 0.24, p = .785$).

Examining the main effect of Status, t-tests revealed a significant difference between the Proximate ($M = 3.63, SD = 2.03$) and Distant ($M = 5.04, SD = 1.99$) status conditions ($t(146.97) = -4.42, p < .001, d = .72$), and between the Distant and Uncertain ($M = 3.74, SD = 1.96$) conditions ($t(148.20) = 4.17, p < .001, d = .68$), but there was no difference between the Uncertain and Proximate conditions ($t(151.45) = -0.35, p = .364$). Examining the main effect of SVO, prosocials ($M = 4.47, SD = 1.99$) were more cooperative than proselfs ($M = 3.72, SD = 2.26$).

Finally, it is worth noting that the histograms of responses in each of the Status conditions seems to indicate that there was more polarization of responses in the Uncertain status condition than in the Proximate or Distant status conditions, though this polarization was not as prominent as it was in Study 3. See Figure 3.2 for the histograms, and see Section B.3 in the Appendix for a summary of diagnostic tests.

3.5.3 Discussion

In the present study, I tested whether there were trait differences in intuitive zero-sum thinking which are reflected in social value orientations. Specifically, I proposed the *trait zero-sum heuristic* hypothesis, which predicted that the zero-sum heuristic was a trait of the proself orientation but not the prosocial orientation.

(a) Proximate Status

(b) Distant Status

(c) Uncertain Status
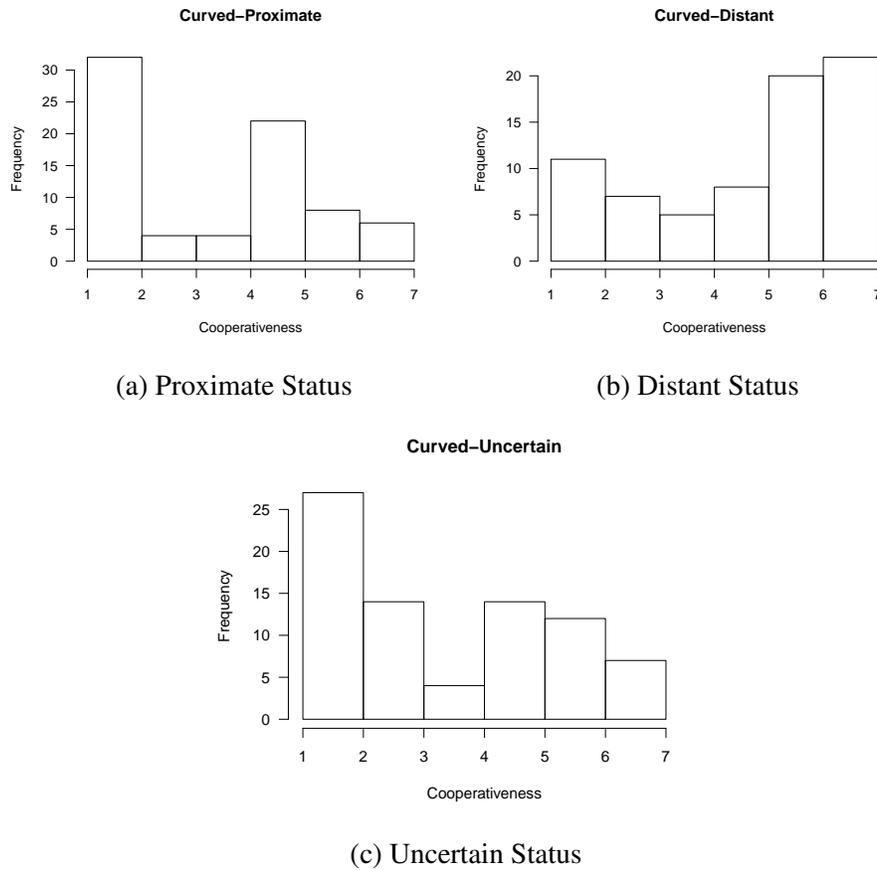
Figure 3.2: Histograms of ratings in the Curved grading conditions.

To test this hypothesis, I used the same classroom scenario as Study 3, and I measured participants' SVOs using the SVO Slider Measure (Murphy et al., 2011). I predicted that uncertain peer status would elicit less cooperation from proselfs than prosocials, because proselfs would be more likely to assume that cooperation would be costly; whereas I predicted that certain peer status would elicit similar levels of cooperation or non-cooperation from prosocials and proselfs.

The zero-sum trait hypothesis was not supported by the data. Although cooperation varied between the peer status conditions, and cooperation also varied between prosocial and proself individuals, no interaction was observed. These results are therefore inconsistent with the possibility that zero-sum intuitions are a feature of the proself—and not the prosocial—orientation. Nevertheless, the

observation that individuals responded similarly to the certain knowledge that cooperation would likely be costly to themselves (proximate status) as they did to uncertain knowledge that cooperation would be costly, is consistent with the possibility that a zero-sum heuristic is driving at least some of the non-cooperation that was observed. How to explain the variability in responses remains an open question for future research. Although little can be concluded from this study about individual differences in zero-sum intuitions, these findings add to a growing body of literature on zero-sum thinking, and provide a further demonstration of the utility of the Social Value Orientation personality construct in predicting cooperative behavior.

3.6 General Discussion

In this chapter, I proposed that zero-sum thinking might operate as a cognitive heuristic that influences judgment when an interaction is uncertain, but could be zero-sum or nonzero-sum due to how resources are allocated. I argued that status proximity is a factor that contributes to how individuals reason and respond to uncertain resource allocations, because proximate peer-status increases the likelihood of zero-sum interaction, whereas distant peer-status does the opposite. Along these lines, I suggested that individuals might possess a "downward mobility heuristic" that leads them to feel uncomfortable with any situation that could result in their loss of status. To test this, in Study 1 students in a university class were presented with a program for pseudo-randomly allocating bonus points, and framing was used to highlight how the program might cause a peer to "get ahead" of (or "catch-up" to) them in status. The program received considerably less support when it was framed in terms of how a peer might get ahead, suggesting that students were uncomfortable with the possibility that their status might decrease.

To more specifically test the role of status proximity in zero-sum thinking, I observed cooperative behavior in a classroom context, by manipulating certainty about the situational conditions that would be necessary for zero-sum interaction to occur. Namely, I manipulated whether grading procedures were curved or noncurved, and also participants' knowledge about the relative status of a peer with whom they were asked to share their notes for an exam. I argued that zero-sum interaction was only certain when both curved grading was used and the peer's status was proximate, because under those conditions the decision to

cooperate would likely be costly. I found that cooperation was lower in this condition, as compared to the condition where curved grading was used but where the peer's status was distant—a situation where cooperation would be unlikely to have any cost. In support of the zero-sum heuristic hypothesis, I found that cooperativeness was roughly as low under conditions where zero-sum interaction was uncertain (curved grading and uncertain peer status) as it was when it was certain (curved grading and proximate peer status).

An interesting finding from Study 3 was that, in a situation where curved grading was used and peer status was uncertain, cooperative responses were consistent with opposing response tendencies. This finding motivated the trait zero-sum heuristic hypothesis, which proposed that zero-sum intuitions were a feature of the proself—but not the prosocial—Social Value Orientation. However, Study 4 did not confirm this hypothesis, and did not replicate the bimodal distribution. Thus, little insight was obtained on the dispositional factors that might drive zero-sum thinking.

Finally, the results of these studies show that when individuals are faced with an uncertain interaction in a situation where some interactions are zero-sum and other interactions are not, they will assume that the interaction is zero-sum and choose to behave competitively as a result. This is consistent with the possibility that individuals are influenced by a zero-sum heuristic, and adds to a growing body of literature on zero-sum intuitions (de Dreu & Boles, 1998; Chernev, 2007; Meegan, 2010), and zero-sum thinking more generally (Różycka-Tran et al., 2015).

3.6.1 Limitations

The main limitation of these studies was that stimuli involved a specific kind of resource dilemma. This means that the some caution should be exercised when generalizing these findings to other situations. Also, many of the same criticisms might be raised about the use of Amazon's Mechanical Turk samples. To avoid redundancy, please see the Limitations section of the previous chapter for a response to these criticisms.

Chapter 4

Conclusions

Zero-sum thinking has been called "the world's worst disease" (Karlgaard, 2006), and linked to various undesirable social outcomes, such as the inability to find mutually beneficial agreements in negotiations (e.g., Thompson & Hastie, 1990), intergroup prejudices and conflict (e.g., Esses et al., 2001), and suboptimal decisions (e.g., Meegan, 2010).

Zero-sum thinking has often been assumed to emerge from beliefs about resource scarcity. In Chapter 1, I argued that zero-sum thinking might also emerge from beliefs about resource entitlements (i.e., the belief that one is entitled to a certain share of resources). Furthermore, I argued that scarcity is not a sufficient condition for zero-sum interaction (and by extension, zero-sum thinking), because there are situations in which resources are scarce, but where interaction is potentially nonzero-sum. Finally, I discussed two psychological roles that zero-sum thinking might fill. The first role is that of a heuristic—an intuitive cognitive process that influences judgment quickly, automatically, and without effort or conscious awareness of the process having taken place. The second role is that of a rationalization—a moral justification that allows individuals to engage in selfish or discriminatory behavior without social sanctioning.

Although zero-sum thinking has been linked to prejudices against certain social groups (e.g., immigrants, see Esses et al., 2001), it has not been examined in the context of multi-partner romantic relationships. Yet, scarcity beliefs have often been discussed as a key difference between the perspectives of monogamists and consensual nonmonogamists (e.g., Easton & Hardy, 2009), and the belief in exclusivity which is central to the definition of monogamy is arguably a type of entitlement belief. At the same time, prejudice against

consensual nonmonogamists is prevalent in Western society where monogamy is normative. For these reasons, in Chapter 2 it was hypothesized that some monogamists would engage in zero-sum thinking when presented with a consensually nonmonogamous relationship—loosely defined as the perception that one person's love gained was another's love lost—and that such zero-sum thinking would lead them to devalue the relationship and individuals in the relationship. Two studies provided convergent findings in support of this hypothesis. It was also hypothesized that, rather than causing the negative appraisal of consensual nonmonogamy, a zero-sum interpretation of the relationship might serve to rationalize the expression of a negative judgment. I made an initial attempt to test this hypothesis, though the results were not supportive.

Although curved grading is often lamented for creating what is assumed to be a competitive (or even downright hostile) environment by virtue of the fact that it creates an artificial shortage of high grades (e.g., Downing, 1994), it is clear that not all interactions in a curved grading environment are zero-sum. In Chapter 3, I argued that, in a curved grading environment, the relative status of students was a critical determinant of whether one student's gain would be a loss for their peer. I hypothesized that individuals would be least likely to cooperate with a peer when: 1) grades were curved, and 2) that peer's status was proximate to their own. Further, I hypothesized that when individuals were uncertain about the status of their peer, they would typically assume that the interaction was zero-sum, and thus choose not to cooperate with the peer. In two studies, I obtained support for these hypotheses. In the second study, I found a bimodal distribution of responses, suggesting the presence of individual differences in zero-sum thinking. On the basis of previous research, I hypothesized that these individual differences could be explained by the Social Value Orientation trait; however, my findings did not support this possibility.

4.1 Future Directions

4.1.1 Zero-Sum Thinking in Romantic Relationships

There are several fruitful areas for future research on the role of zero-sum thinking in relationships. First, researchers should further explore the role of a zero-sum rationalization in anti-CNM prejudice. In particular, the reputation-defense

function of a zero-sum rationalization is one aspect that should be examined, and research that experimentally manipulates the cognitive accessibility of a rationalization should use proper methodology to distinguish between direct and moderating effects. Second, researchers could explore how zero-sum thinking and anti-CNM prejudice vary with different types of CNM relationship structures. Of particular interest would be hierarchical CNM relationships where partners occupy "primary" and "secondary" roles, and non-hierarchical CNM relationships where partners are all considered to be equals (Taormino, 2008). Monogamists might perceive there to be less of a zero-sum trade-off for the primary partner in hierarchical arrangement, because the hierarchy would imply "priority access" to resources.

If the association between zero-sum thinking and anti-CNM prejudice is indeed causal, then it follows that some anti-CNM prejudice could be reduced by intervening on the zero-sum thinking or beliefs. Along these lines, applied researchers could test exposure to the nonzero-sum, resource-abundance perspectives held by many CNM individuals; as well as the nonzero-sum beliefs that monogamists themselves may hold about the resources in other types of relationships, such as family relationships or friendships. Researchers could also target beliefs about scarcity by developing an understanding around individual capacities for loving or sustaining multiple relationships. By highlighting that this might be an experience that some individuals have but not others, it might open the possibility for some monogamists to accept that CNM individuals are genuine in their convictions, even if they themselves are unable to imagine loving multiple people or sustaining multiple romantic relationships.

Interventions that seek to address anti-CNM prejudice by targeting zero-sum thinking might work by reducing zero-sum beliefs, but it is important to recognize that this is not the only possibility. As discussed previously, the zero-sum thinking that some monogamists engage in when interpreting CNM relationships might be understood as a *misapplication* of zero-sum logic, from one domain in which such logic is usually correct (monogamous relationships) to another domain in which it might be incorrect (CNM relationships). If this is the case, then increased familiarity with CNM might actually reduce anti-CNM prejudice while leaving zero-sum beliefs intact—by reducing the misapplication of zero-sum logic. For this reason, changing beliefs should not necessarily be considered the goal of these interventions, and future research should consider both possibilities.

The present research is most applicable to CNM that is centrally constructed around loving relationships, such as polyamory and to a lesser extent open relationships, because the vignettes depicted a relationship in which individuals formed multiple loving relationships and we measured zero-sum thinking about love. However, it is possible that zero-sum thinking about love would be applicable to CNM relationships where couples engage in extradyadic sexual activity without romantic attachment, as in the case of swinging (Matsick et al., 2014). For example, many individuals appear to conflate sexual aspects of a relationship with other relationship qualities like love (Birnbaum et al., 2006), and therefore might perceive extradyadic sex as having zero-sum consequences for the love within a relationship. However, there are other factors to consider, such as the perceived risks of sexually-transmitted infections (Moors et al., 2013), which may be more relevant to address in the context of CNM prejudice where CNM is not centrally constructed around multiple loving relationships. It may be of interest for future research to determine whether zero-sum thinking about other relationship resources (e.g., sexual activity) might be involved in anti-CNM prejudice where CNM is primarily of a sexual nature.

Finally, zero-sum thinking may also be relevant to other relationship outcomes and may be relevant to monogamous relationships. For example, many scholars have suggested that the desire for exclusivity is a root cause of romantic jealousy (Ben-Ze'ev, 2010; Buunk, 1998; Hupka et al., 1985; Silva, 1997) and some have suggested that romantic jealousy specifically stems from a zero-sum appraisal of relationship resources (Ben-Ze'ev, 2010; Neu, 1980). This suggests that zero-sum romantic beliefs should also explain sensitivity to jealousy, and by extension any behaviors motivated by such jealousy. To the extent that a monogamous individual displays romantic interest in a person who is not their partner, they might be seen as that much less interested in their actual partner by someone who holds zero-sum romantic beliefs.

4.1.2   Zero-Sum Thinking in the Classroom

Future research should explore the role of zero-sum thinking in other types of classroom dilemmas where circumstances might elicit zero-sum intuitions, and where such intuitions might lead to fairness concerns or counterproductive behavior. One situation that could be examined is the case where accommodations are granted to students with disabilities (e.g., double-time on exams). Although

accommodations are given under the assumption that they serve to "level the playing field," it stands to reason that the peers of these students might feel threatened by any change in the playing field that might place them at a disadvantage. In other words, students might perceive that their peers with disabilities who receive accommodations stand to gain at their expense, and for that reason they might object to the accommodations.

A second area for research would be to examine the factors that moderate the association between zero-sum cognitions and competitive behavior. In the classroom scenario that was used in these studies, the peer with whom participants were asked to cooperate was an unknown person. This raises a question as to how individuals might behave if this person was a friend or a peer with whom they could expect future interactions. Even if participants judged an interaction with the peer to be zero-sum, they might not choose to behave competitively towards that peer; the prospect of future interaction would mean that there is a possibility for reciprocation, and thus for long-run mutual gain.

Finally, researchers should further explore the perceptual or dispositional factors that are be responsible for zero-sum intuitions. An obvious candidate would be the zero-sum belief system that Różycka-Tran et al. (2015) have described and developed a scale to measure. If the zero-sum belief system is indeed domain-general, then it should help to explain decision-making under any condition where individuals have uncertain knowledge about whether an interaction is in fact zero-sum, as with the uncertain peer status scenario that was used for the studies in Chapter 3.

4.2 Final Remarks

Broadly speaking, this research contributes to a growing body of literature on the process of zero-sum thinking and its social consequences. Although it has focused on two negative consequences of zero-sum thinking, it should not be concluded that zero-sum thinking or is necessarily a bad thing or that individuals who express a zero-sum appraisal of a situation are bad people. To the extent that a situation is in fact zero-sum, a correct appraisal of the situation could be adaptive and useful. For example, if Wright (2001) is correct in his assessment that the creation of new forms of *nonzero-sum* interaction drive cultural progress

and societal welfare, then the ability to identify zero-sum interactions would seem to contribute to that goal.

More specifically, this thesis contributes to understanding social behavior in two contexts. First, this research demonstrates that individuals who engage in zero-sum thinking about a consensually nonmonogamous relationship are more strongly opposed to these relationships and the individuals who participate in them. Throughout history, individuals who have engaged in nonnormative consensual romantic or sexual practices have been subject to ill treatment—homosexuality being one example where society has made progress in understanding and respecting differences, but where much progress still remains. Consensual nonmonogamy appears to be in the earliest stages of gaining exposure and ultimately tolerance. By understanding one of the reasons why individuals might judge consensual nonmonogamy harshly, the present research takes one of the many steps needed towards greater social justice.

Finally, this research demonstrates that when individuals are faced with the uncertain prospect of zero-sum interaction in a classroom, they have a tendency to assume that it is zero-sum and will behave non-cooperatively as a result. To the extent that zero-sum thinking promotes antagonistic "cut-throat" behavior or non-cooperation which is contrary to pedagogical outcomes, it is important to address the sources of zero-sum thinking in the classroom and promote an awareness of nonzero-sum possibilities for interaction.

Appendix A

Chapter 2 Appendix

A.1 Study 1 Diagnostics

A.1.1 Zero-Sum Thinking

We performed diagnostics appropriate to checking the assumptions of t-test. First, we screened for univariate outliers by calculating Z-scores for each rating within each of the conditions, using a Z-score of +/- 3 to identify outliers. Afterwards, we tested normality by examining skewness and kurtosis using *agostino.test* {*moments*} and *anscombe.test* {*moments*} R packages, which implement the D'Agostino and Anscombe-Glynn tests, respectively.[1] A conventional but conservative alpha criterion of .001 was used for significance testing of skewness and kurtosis (Tabachnick et al., 2001).

One univariate outlier was observed in the Monogamy condition, and one outlier was also observed in the CNM condition. In the Monogamy condition, zero-sum thinking scores were positively skewed ($skew = 2.53, z = 5.47, p < .001$) and leptokurtic ($kurt = 9.88, z = 4.68, p < .001$). In the CNM condition, zero-sum thinking scores were normal in terms of skewness ($skew = -0.58, z = -1.86, p = .062$), and also in terms of kurtosis ($kurt = 1.30, z = 1.95, p = .051$).

Although the assumption of normality was violated in the Monogamy condition, the t-test is robust to this violation as long as the sample size is sufficiently

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[1] Note: Kurtosis is reported as the difference from the expected value of 3.

large (i.e., 25 or 30, see Howell, 2012). Presently, sample sizes were 54 and 57 for the Monogamy and CNM conditions, respectively. Given how few outliers there were, we decided against applying any outlier remedies.

A.1.2 Evaluative Judgments

Prior to conducting these analyses we screened the data for outliers and then performed diagnostics appropriate to checking the assumptions of ANOVA. First, we screened for univariate outliers by calculating Z-scores for each rating within each condition, using a Z-score of +/- 3 to identify outliers. Afterwards, we tested the assumptions of univariate normality and homogeneity of variances. To examine normality, we performed tests of skewness and kurtosis using the *agostino.test* {*moments*} and *anscombe.test* {*moments*} R packages, which implement the D'Agostino and Anscombe-Glynn tests, respectively. A conventional but conservative alpha criterion of .001 was used for significance testing of skewness and kurtosis (Tabachnick et al., 2001). To examine homogeneity of variances, the *leveneTest* {*car*} R package was used to perform Levene's test.

There were two univariate outliers in the CNM condition with Satisfaction, one in the CNM condition with Longevity, and one in the Monogamy condition with Trustworthiness. As reported in Table A.1, Satisfaction ratings were positively skewed in the CNM condition ($ps < .001$); all other subsamples were normal ($ps > .001$). Neither Satisfaction ratings ($F(1, 109) = 3.89, p = .051$) nor Longevity ratings ($F(1, 109) = 0.21, p = .650$) violated the assumption of homogeneity; however, Trustworthiness ratings did violate this assumption ($F(1, 109) = 11.14, p < .001$).

Because the assumption of homogeneity was not met with Trustworthiness, we specified a heteroscedasticity-corrected coefficient covariance matrix in this ANOVA model. For the other ANOVA models, we did not specify a corrected covariance matrix. Although the assumption of normality was violated with all tests, the ANOVA and t-test procedures are robust to this violation as long as there are 20 (30) or more degrees of freedom.

Table A.1: Tests of skewness and kurtosis.

Condition	Rating	Skewness			Kurtosis		
		value	z	p	value	z	p
Monogamy	Satisfaction	−0·83	−2·49	·013	−0·61	−0·95	·343
	Longevity	−0·90	−2·68	·007	−0·48	−0·59	·558
	Trustworthiness	−0·89	−2·67	·008	0·24	0·78	·433
CNM	Satisfaction	1·20	3·43	<·001	1·37	2·01	·045
	Longevity	1·07	3·15	·002	0·78	1·46	·145
	Trustworthiness	0·14	0·49	·626	−0·47	−0·61	·545

Note: Kurtosis is reported as the difference from the expected value of 3.

A.1.3 Mediation Analysis

Mediation analysis inherits all of the assumptions of a general linear model. We therefore performed diagnostics appropriate to checking the assumptions of linear regression: normality of residuals, homoscedasticity using the *ncvTest* {*car*} R package which implements the Breusch-Pagan test, and independence of errors using the *durbinWatsonTest* {*car*} R package which implements the Durbin-Watson test. First the data were screened for multivariate outliers. To identify multivariate outliers, we computed Cook's distance, which identifies "influential" cases that have leverage (an extreme value on a predictor variable) and discrepancy (an unusual value on a dependent variable given its value on a predictor variable). The recommended cutoff of $4/(n - k - 1)$ was used to identify influential cases (Fox, 1991).

Because mediation analysis essentially involves the simultaneous estimation of multiple regressions, we decided to proceed with the diagnostics by examining the individual pathways comprising any given mediation. For example, with the analysis in which we planned to examine whether Zero-Sum Thinking (ZST) mediates the association between experimental condition (Cond) and Relationship Satisfaction (Satisfaction), we would consider the Cond → ZST, Cond → Satisfaction, and ZST → Satisfaction pathways. We adopted this piecemeal

approach because we were not aware of any diagnostic procedures that would account for the full mediational structure. When testing for outliers in the Cond $\rightarrow$ ZST, Cond $\rightarrow$ Satisfaction, Cond $\rightarrow$ Longevity, and Cond $\rightarrow$ Trustworthiness pathways, we refer to previously reported univariate outlier analyses. For the ZST $\rightarrow$ Rlong, ZST $\rightarrow$ Satisfaction, and ZST $\rightarrow$ Trustworthiness pathways, we checked for multivariate outliers.

There were six multivariate outliers (5% of the data) with ZST $\rightarrow$ Satisfaction, one multivariate outlier (1% of the data) with ZST $\rightarrow$ Longevity, and eight multivariate outliers with ZST $\rightarrow$ Trust (7% of the data). In a mediation analysis, the impact of outliers is not clear. Hayes (2013) suggests there is little research into the effects of outliers with bootstrap techniques, and Zu & Yuan (2010) argues that bootstrap confidence intervals can be invalidated by the presence of outliers. Zu & Yuan (2010) describes a robust procedure for mediation analysis which minimizes the influence of outliers by weighting observations according to their location, thereby downweighting extreme cases. Given our uncertainty, we decided to use this robust bootstrap procedure, in addition to the non-robust bootstrap method.

Next, we tested the normality of residuals by first calculating studentized residuals, and then performing the D'Agostino and Anscombe-Glynn tests to assess skewness and kurtosis. Again, we used an alpha criterion of .001 to determine significance. Table A.2 summarizes the tests. Both Cond $\rightarrow$ LoveChangeScore and Cond $\rightarrow$ Satisfaction; pathways were leptokurtic and skewed. Next, we tested the assumption of homoscedasticity. Table A.3 summarizes these tests. This assumption was violated for Cond $\rightarrow$ LoveChangeScore, Cond $\rightarrow$ Satisfaction, and Cond $\rightarrow$ Trustworthiness. Finally, we tested the assumption of independence of errors. Table A.4 summarizes these tests. All models satisfied this assumption.

Because the assumption of homogeneity was not met with the Cond $\rightarrow$ LoveChangeScore pathway, a pathway that was a component in all mediation models, we decided to perform a supplementary normal theory mediation analyses with a heteroscedasticity-corrected coefficient covariance matrix ("hc3") specified. Although the normality of residuals assumption was violated with several of the components, this assumption doesn't appear to be particularly crucial (Gelman & Hill, 2006; Hayes, 2013).

Table A.2: Tests of skewness and kurtosis for mediation pathways.

Pathway	Skewness			Kurtosis		
	value	Z	p	value	Z	p
Cond → LoveChangeScore	−0·85	−3·45	<·001	5·64	4·68	<·001
Cond → Satisfaction	1·10	4·23	<·001	2·80	3·48	<·001
Cond → Longevity	0·35	1·55	·121	0·63	1·47	·143
Cond → Trustworthiness	0·07	0·34	·734	0·62	1·45	·147
LoveChangeScore → Satisfaction	−0·55	−2·36	·018	−0·08	0·13	·897
LoveChangeScore → Longevity	−0·54	−2·31	·021	−0·22	−0·25	·804
LoveChangeScore → Trustworthiness	−0·59	−2·51	·012	0·29	0·91	·365

Note: Kurtosis is reported as the difference from the expected
value of 3.

Table A.3: Tests of homogeneity for mediation pathways.

Pathway	Chisq	p
Cond → LoveChangeScore	34·70	<·001
Cond → Satisfaction	13·34	<·001
Cond → Longevity	0·79	·372
Cond → Trustworthiness	20·20	<·001
LoveChangeScore → Satisfaction	0·81	·368
LoveChangeScore → Longevity	2·09	·148
LoveChangeScore → Trustworthiness	3·52	·061

Table A.4: Tests of independence of errors for mediation pathways.

Pathway	DW	p
Cond → LoveChangeScore	2·13	·422
Cond → Satisfaction	1·68	·082
Cond → Longevity	1·81	·342
Cond → Trustworthiness	1·86	·400
LoveChangeScore → Satisfaction	2·12	·594
LoveChangeScore → Longevity	2·08	·682
LoveChangeScore → Trustworthiness	1·93	·730

A.2   Study 1 Supplementary Analysis

A.2.1   Mediation Analysis

Our mediation diganostics motivated us to perform two supplementary mediation analyses. The first was a robust bootstrap method, as implemented in the *ZYmediate* {*WRS*} R package (Wilcox, 2012). For the robust analysis, we instructed the procedure to weight a proportion of cases equal to the proportion of unique outliers observed for the respective mediation model using the kappa parameter. The second was a normal theory test using a correction for heteroscedasticity. For this test, we used the Hayes's (2013) PROCESS macro version 2.15, in SPSS version 22.

The results of these supplementary analyses, reported in Table A.5 and Table A.6, are similar to those obtained with the bias-corrected bootstrap method. Namely, love change scores were found to mediate the effect of experimental vignette on Satisfaction, love change scores mediated the effect of experimental vignette with Longevity (marginally significant in the case of the robust mediation, and significant in the case of the normal theory test), and no mediation was observed in the case of Trustworthiness.

Table A.5: Robust boostrapped mediation analyses.

		Indirect Effect		
Outcome	B	95% CI Lower	95% CI Upper	p
Satisfaction	−0·44	−0·83	−0·08	·017
Longevity	−0·41	−0·88	0·02	·062
Trust	0·08	−0·47	0·63	·778

Table A.6: Normal theory mediation analyses.

	Indirect Effect			Direct Effect		
Outcome	B	Z	p	B	t	p
Satisfaction	−0·50	−2·56	·010	−3·72	−12·61	<·001
Longevity	−0·45	−2·00	·045	−3·59	−10·05	<·001
Trust	0·02	0·07	·942	−2·83	−7·23	<·001

A.3 Study 3 Diagnostics

A.3.1 Evaluative Judgments

Prior to conducting the omnibus tests, we performed diagnostics appropriate to checking the assumptions of ANOVA and Student's t-tests. First, we screened for univariate outliers by calculating Z-scores for each rating within each condition, using a Z-score of +/- 3 to identify outliers. We then assessed the assumption of univariate normality by performing tests of skewness and kurtosis using the *agostino.test* {*moments*} and *anscombe.test* {*moments*} R packages, which implement the D'Agostino and Anscombe-Glynn tests, respectively. A conventional but conservative alpha criterion of .001 was used for significance testing of skewness and kurtosis (Tabachnick et al., 2001). Finally, we tested the

assumption of equal variances using the *leveneTest* {*car*} R package to perform Levene's test.

In the CNM+R condition, one univariate outlier were observed (2% of data, 1 out of 60); no outliers were observed in the Monogamy or CNM' conditions. In the Monogamy condition, scores were normal in terms of skewness (*skew* $= -0.57, Z = -1.85, p = .064$) and kurtosis (*skew* $= -0.80, Z = -1.63, p = .102$). In the CNM' condition, scores were also normal in terms of skewness (*kurt* $= -0.04, Z = -0.13, p = .894$) and kurtosis (*kurt* $= -0.39, Z = -0.41, p = .679$). In the CNM+R condition, scores were also normal in terms of skewness (*kurt* $= 1.04, Z = 3.10, p = .002$) and kurtosis (*kurt* $= 3.17, Z = 3.10, p = .002$). Finally, the equal variances assumption was met ($F(2, 170) = 1.21, p = .301$).

A.4 Study 3 Supplementary Analysis

A.4.1 Unidimensionality of Evaluative Judgments

As a supplementary measure of unidimensionality, we assessed the ω_h coefficient. Prior to computing ω_h, we examined the general factor loadings for each item using an unrotated principal components analysis.

The general factor loadings obtained with a principal components analysis are summarized in Table A.7. All items were found to have acceptable general factor loadings, and all loadings were also large ($> .50$). In the Monogamy condition, ω_h was .98 (bootstrapped 95% CI $= [.96 to .98]$). In the combined CNM conditions, ω_h was .93 (bootstrapped 95% CI $= [.90 to .95]$).

A.4.2 Effect of Disapproval

It might be possible that participants didn't consider the opinion expressed by Susie's mother to be relevant when forming their own interpretation and evaluation of the scenario. In other words, our attempts to increase the accessibility of a zero-sum rationalization for CNM prejudice might have failed because the mother was not perceived to be a credible source and her expressed opinion was

Table A.7: Evaluative judgments principal components general factor loadings.

Item	Monogamy	CNM
1	·90	·68
2	·86	·83
3	·84	·73
4	·92	·68
5	·90	·81
6	·91	·81
7	·88	·57
8	·76	·63
9	·75	·62
10	·88	·59
11	·92	·74
12	·89	·69
13	·85	·65
14	·81	·73
15	·86	·80
16	·85	·63

disregarded. This possibility motivated us to perform a supplementary analysis to examine the effect of disapproval, as a means of testing whether Susie's mother had any effect on evaluations. This was done by comparing mean scores between the CNM conditions of Studies 2 and 3.

Recall that one of the modifications that we made to the vignettes in the present experiment was to introduce Susie's mother who expressed disapproval of Susie's relationship with Dan. This change was made to both the CNM and CNM+R conditions (as well as to the Monogamy condition, though we decided not to compare these conditions). Therefore, the effect of Susie's mother's expressed disapproval on participants' evaluations could not be tested using data from the present experiment alone, but could be tested by comparing Study 2 with the present experiment.

We might predict that Susie's mother's disapproval would generate more negative appraisals overall, assuming she was perceived to be a credible source ("mother knows best"). However, a t-test revealed that evaluative judgment scores did not differ between the two studies ($F(171) = 0.518, p = .605; M_{S3} = 3.03, SD_{S3} = 1.01; M_{S2} = 2.95, SD_{S2} = 0.98$).

A.5   Preliminary Study

This preliminary study is presented in order to address any concerns that might be raised about the vignette that was used in the studies reported in this chapter. As in Study 1, this preliminary study examines the extent to which individuals engage in zero-sum thinking when judging a CNM relationship, and the extent to which they perceive that relationship as fair or unfair. In addition to fairness judgments, participants also made love and time judgments. As in Study 1, a mediation model was tested. The hypothesized model is illustrated in Figure A.1.

A.5.1   Method

A.5.1.1   Participants

In all, 100 individuals from the United States (45 women, 55 men; $M_{age} = 33.56$ $SD_{age} = 10.356$; 22 were single, 76 were in a relationship, and 2 stated "other"
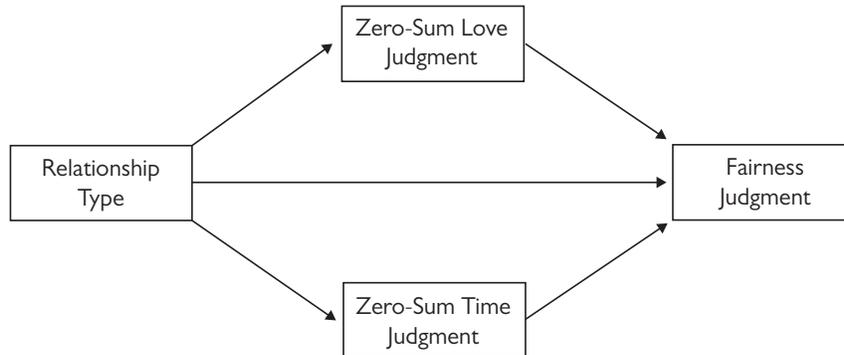
Figure A.1: Hypothesized multiple-mediation model.

for their relationship status; 93 identified as monogamous and 7 identified as monogamish) were recruited from Amazon's Mechanical Turk (www.mturk.com) during May 2014, and compensated with $0.30. All participants consented to participate, and the study was approved by the University of Guelph Research Ethics Board (#13DC025). Because we are interested in the responses of monogamous individuals, only the monogamous participants were analyzed (similar results were obtained with the monogamish participants included).

A.5.1.2 Materials and Procedure

As in Study 1, participants were randomly assigned to read a vignette that depicted two characters who were in a heterosexual monogamous or CNM relationship. Prior to receiving a vignette, participants were first asked to answer basic demographic questions (age, sex, education, and relationship status).

A template was used to construct the vignettes. In this template, the first statement identified the relationship type, in the case of CNM the second statement identified the agreement to be CNM, and the final statement was filler content. For example, the female-protagonist vignette stated (brackets indicate content that was specific to the CNM version):

Sophie is in a serious relationship with Ethan [and Lucas].

[Sophie and Ethan agreed they can see other people.]
Ethan is a professional actor.

Participants were asked to rate love ("To what extent does Sophie love Ethan?"), time ("How much time does Sophie spend with Ethan?") and fairness ("How fair is Sophie being to Ethan?") judgments.

A.5.2 Results

A.5.2.1 Analysis of Means

A one-way Multivariate Analysis of Variance (MANOVA) was performed in which relationship type was entered as the predictor of love, time, and fairness ratings. This test revealed that all ratings were significantly lower for the CNM (vs. monogamous) protagonist—love ratings ($M_{Mono.} = 14.73, SD_{Mono.} = 3.09; M_{CNM} = 9.04, SD_{CNM} = 4.48; F(1, 91) = 51.30, p < .001$), time ratings ($M_{Mono.} = 11.52, SD_{Mono.} = 4.67; M_{CNM} = 9.56, SD_{CNM} = 3.79; F(1, 91) = 4.92, p = .029$), and fairness ratings ($M_{Mono.} = 13.20, SD_{CNM} = 3.07; M_{CNM} = 9.60, SD_{CNM} = 5.65; F(1, 91) = 14.73, p < .001$). Thus, participants perceived that the CNM (vs. monogamous) protagonist loved their partner less, spent less time with their partner, and was less more fair to their partner.

A.5.2.2 Mediation Analysis

The mediation analysis uses a bootstrapping approach and is performed using Hayes's (2013) PROCESS macro with model 4. Indirect effects are tested by examining bias-corrected two-sided confidence intervals calculated using bootstrapping with 10,000 samples.

The mediation analysis revealed a significant indirect effect of love judgments ($B = -3.61, 95\% \ CI = [-5.54, -2.09]$), as the confidence interval did not include zero; whereas the indirect effect for time judgments was small and insignificant ($B = -0.03, 95\% \ CI = [-0.57, 0.34]$). In this model, the direct effect was insignificant ($B = 0.04, 95\% \ CI = [-1.96, 2.03]$), which indicates that the effect of relationship type on fairness ratings was fully mediated by love judgments.

A.5.3 Discussion

As in Study 1, the results suggest that monogamous individuals engage in zero-sum thinking when interpreting the love in CNM relationships, and that such zero-sum thinking is associated with anti-CNM prejudice. For this reason, we do not believe the findings reported in Study 1 or Study 2 can be explained as artifacts of the vignette that was used.

Appendix B

Chapter 3 Appendix

B.1   Study 2 Diagnostics

I screened the data for outliers and then performed diagnostics appropriate to checking the assumptions of ANOVA. First, I screened for univariate outliers by calculating Z-scores for each rating within each of the conditions, using a Z-score of +/- 3 to identify outliers. Afterwards, I tested the assumptions of univariate normality and homogeneity of variances. To examine normality, I performed tests of skewness and kurtosis using the *agostino.test {moments}* and *anscombe.test {moments}* R packages, which implement the D'Agostino and Anscombe-Glynn tests, respectively. A conventional but conservative alpha criterion of .001 was used for significance testing of skewness and kurtosis (Tabachnick et al., 2001). To examine homogeneity of variances, the *leveneTest {car}* R package was used to perform Levene's test.

There was one univariate outlier each in the Noncurved-Proximate (2%, 1 out of 60) and Noncurved-Distant conditions (2%, 1 out of 57); no outliers were observed in the Curved conditions. Responses were negatively skewed and leptokurtic in the Noncurved-Proximate condition and responses were also negatively skewed in the Noncurved-Distant condition (*ps* < .001); responses were normal in both of the Curved conditions (*ps* > .001). The assumption of homogeneity was also violated ($F(3, 230) = 7.45, p < .001$). See Table B.1 for a summary of normality tests.

Table B.1: Tests of skewness and kurtosis.

		Skewness			Kurtosis		
Grading	Status	value	Z	p	value	Z	p
Curved	Proximate	0·13	0·44	·658	−1·04	−2·86	·004
	Distant	−0·89	−2·69	·007	−0·16	0·11	·911
Noncurved	Proximate	−2·23	−5·28	<·001	6·55	4·19	<·001
	Distant	−1·38	−3·80	<·001	1·65	2·23	·026

Because the homogeneity assumption was violated, I decided to specify a correction for heteroscedasticity ("hc3") in the ANOVA model (Hayes & Cai, 2007), and to also allow for unequal variances in any pairwise tests and effect size calculations. Although the assumption of normality was violated, the ANOVA procedure is robust to the violation of this assumption. Howell (2012) suggest that the assumption of normality is not crucial and can be violated without consequence (except in extreme circumstances), and Fidell & Tabachnick (2003) suggest that normality is not an issue with grouped data when there are sufficient degrees of freedom for error. In the present sample, the smallest group size was comprised of 56 subjects, which satisfies this criteria. Given how few outliers there were, I decided against outlier remedies.

B.2 Study 3 Diagnostics

I screened the data for outliers and then performed diagnostics appropriate to checking the assumptions of ANOVA. There was one univariate outlier each in the Curved-Distant (3% of data, or 1 out of 30 observations) and Noncurved-Distant conditions (3% of data, or 1 out of 30 observations); no outliers were observed in the remaining conditions. Responses were negatively skewed in the Curved-Distant and Noncurved-Distant conditions ($ps < .001$); responses were normal in the remaining conditions ($ps > .001$). The assumption of homogeneity was also violated ($F(5, 174) = 3.86, p = .002$). See Table B.2 for a summary of normality tests.

Table B.2: Tests of skewness and kurtosis.

Grading	Status	Skewness			Kurtosis		
		value	Z	p	value	Z	p
Curved	Proximate	0·41	1·06	·288	−0·84	−1·08	·281
	Distant	−1·54	−3·30	<·001	1·95	2·20	·028
	Uncertain	−0·22	−0·57	·568	−1·38	−3·22	·001
Noncurved	Proximate	−0·84	−2·04	·042	−0·35	−0·03	·979
	Distant	−2·08	−4·04	<·001	4·23	3·14	·002
	Uncertain	−1·36	−3·01	·003	1·48	1·91	·057

Because the homogeneity assumption was violated, I decided to specify a correction for heteroscedasticity ("hc3") in the ANOVA model (Hayes & Cai, 2007), and to also allow for unequal variances in any pairwise tests as appropriate. Although the assumption of normality was violated, the ANOVA procedure is robust to the violation of this assumption. Howell (2012) suggest that the assumption of normality is not crucial and can be violated without consequence (except in extreme circumstances), and Fidell & Tabachnick (2003) suggest that normality is not an issue with grouped data when there are sufficient degrees of freedom for error. In the present sample, all groups had 30 subjects, which satisfies this criteria. Given how few outliers there were, I decided against outlier remedies.

B.3 Study 4 Diagnostics

I screened the data for outliers and then performed diagnostics appropriate to checking the assumptions of ANOVA. No univariate outliers were observed. Seven multivariate outliers were observed, representing 3% of the total data (7 out of 227). Responses were platykurtic in the Proximate-proself, Proximate-prosocial, and Uncertain-prosocial; but otherwise normal. The assumption of

Table B.3: Tests of skewness and kurtosis.

Grading	Status	Skewness			Kurtosis		
		value	Z	p	value	Z	p
Proself	Proximate	0·34	0·87	·382	−1·41	−3·29	<·001
	Distant	−0·36	−0·94	·350	−1·38	−3·23	·001
	Uncertain	0·32	0·91	·360	−1·26	−3·25	·001
Prosocial	Proximate	−0·12	−0·39	·697	−1·33	−4·24	<·001
	Distant	−1·10	−2·9	·004	0·21	0·75	·451
	Uncertain	0·01	0·04	·969	−1·31	−3·41	<·001

homogeneity was marginally violated ($F(5, 221) = 1.95, p = .088$). See Table B.3 for a summary of normality tests.

Because the homogeneity assumption was violated, I decided to specify a correction for heteroscedasticity ("hc3") in the ANOVA model (Hayes & Cai, 2007), and to also allow for unequal variances in any pairwise tests and effect size calculations. Given how few outliers there were, I decided against outlier remedies.

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