

# Inequality and Risk-Taking

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## Abstract

Inequality has been associated with risk-taking at the societal level. However, this relationship has not been directly investigated at the individual level. Risk-sensitivity theory predicts that decision makers should increase risk-taking in situations of disparity between one's present state and desired state. Economic inequality creates such a disparity. In two experiments, we examined whether imposed economic inequality affects risk-taking. In Experiment 1, we examined whether victims of inequality engaged in greater risk-taking compared to beneficiaries of inequality and those not experiencing inequality. In Experiment 2, we examined whether ameliorating inequality for victims reduced risk-taking. In both experiments, victims of inequality engaged in greater risk-taking compared to beneficiaries of inequality and those not experiencing inequality. Among victims, amelioration of inequality contributed to decreased risk-taking. These findings provide further evidence in support of risk-sensitivity theory and suggest that reductions in economic inequality may lead to lower risk-taking.

## Keywords

inequality, risk-taking, risk-sensitivity theory, judgment and decision making

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## Introduction

Economic inequality has been rising in developed and developing nations for decades. In the United States, for example, recent data show that the richest 1% of the population controls 35% of the nation's wealth, and the richest 20% of the population control 85% of the nation's wealth (Wolff, 2010). Since the great recession of 2008, this divide has only increased (Piketty, 2014). Similar trends have been observed even in such historically egalitarian regions as Scandinavia. These increases in inequality have important implications: Inequality has been linked to a wide array of negative health and well-being outcomes at the societal level, many of which involve risk-taking. In the following, we (1) review evidence linking inequality and risk-taking at the societal level, (2) review evidence suggesting that inequality should be associated with risky behavior at the individual level, and (3) present two experiments examining the effect of individual-level economic inequality on risk-taking.

outcomes, high prisoner incarceration rates, obesity, low social mobility, reduced trust, and poorer community life (reviewed in Wilkinson & Pickett, 2006, 2007, 2009). Importantly, economic inequality has been associated with negative societal health and well-being outcomes above and beyond absolute individual-level economic factors (e.g., socioeconomic status; poverty; e.g., Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Wilkinson, 1996). Of the many health and well-being outcomes associated with economic inequality at the societal level, many involve risk-taking. Specifically, societal-level economic inequality has been reliably associated with such diverse forms of risk-taking and risky behavior as sexual promiscuity (Gold, Kennedy, Connell, & Kawachi, 2002), violence (Morenoff, Sampson, & Raudenbush, 2001), drug and substance abuse (Room, 2005), and crime (Daly, Wilson, &

## *Inequality and Risk-Taking at the Societal Level*

A wide array of negative societal outcomes have been associated with economic inequality, including violence and homicide, poor physical and mental health, poor educational

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Vasdev, 2001; reviewed in Wilkinson & Pickett, 2006, 2007, 2009).

Such behaviors are risky because they involve high variance in outcome (typically involving potential high payoffs of low probability; Pleskac & Hertwig, 2014). The definition of risk as outcome variance has been widely used across behavioral science disciplines, including biology, economics, and psychology (Daly & Wilson, 2001; Friedman & Savage, 1948; Real & Caraco, 1986; Rubin & Paul, 1979; Winterhalder, Lu, & Tucker, 1999; Wang, 2002; Weber, Shafir, & Blais, 2004; reviewed in Mishra, 2014). We note that this definition of risk is consistent with the more colloquial understandings of risk as hazard, danger, or exposure to (often severe) downside costs (reviewed in Mishra, 2014; Mishra, Barclay, & Sparks, under review).

### *Inequality and Risk-Taking at the Individual Level*

Although societal-level correlational evidence suggests that economic inequality is associated with risky behavior, little experimental research has directly examined the link between inequality and risk-taking behavior at the individual level. Some indirect evidence, however, is suggestive. Greenberg (1993) demonstrated that people who were underpaid relative to expectations were more likely to engage in theft, stealing an amount in excess of that which they were initially owed. Of note, this study examined inequity—the ratio of relevant inputs (e.g., education) to outcomes (e.g., income)—not inequality. Both equity and equality, however, reflect fairness in the distribution of outcomes (i.e., distributive justice; Colquitt, Conlon, Wesson, Porter, & Ng, 2001), making this study at least somewhat suggestive.

Inequality at its core describes one's relative position compared to relevant others (i.e., inequality is a form of disparity), and relative position is a key functional motivator of behavior, including risk-taking (e.g., Ermer, Cosmides, & Tooby, 2008; Hill & Buss, 2010; Mishra, Barclay, & Lalumière, 2014). Under the eye of natural selection, outcompeting others for mates, resources, status, and other evolutionary relevant resources—with resultant fitness consequences—is of utmost importance. Income (and wealth more generally) is a key resource, with downstream effects of conferring social status and attracting mates. As a consequence, inequality should be particularly salient to decision making because it necessarily creates disparity and competitive (dis)advantage between individuals. Affective responses associated with inequality (namely, anger and frustration) appear to be linked with increased risk-taking (e.g., Callan, Ellard, Shead, & Hodgins, 2008; Fessler, Pillsworth, & Flamson, 2004; Leith & Baumeister, 1996). However, to our knowledge, no studies have directly examined whether individual-level inequality causes risk-taking behavior.

### *Risk-Sensitivity Theory and Inequality*

Risk-sensitivity theory provides a functional framework for understanding when disparity should motivate risk-taking

behavior. People are generally risk-averse, preferring low-variance options to high-variance options (Kahneman & Tversky, 1984; Mishra, 2014). Risk-sensitivity theory, however, predicts that decision makers should shift from risk-aversion to risk-preference in situations of high *need*, where *need* describes disparity between an individual's present state and goal (or desired) state (Mishra, 2014; Mishra & Lalumière, 2010; Stephens, 1981; Stephens & Krebs, 1986). Risk-sensitivity theory was originally developed in the field of evolutionary biology to explain risky behavior in foraging animals (Caraco, Martindale, & Whittam, 1980; Stephens, 1981; Stephens & Krebs, 1986). Since these initial studies, a large body of evidence has provided support to the basic tenets of risk-sensitivity theory in the animal behavior literature (especially risk escalation in response to need), although non-human animal findings have been somewhat inconsistent (reviewed in Kacelnik & Bateson, 1996, 1997; Kacelnik & El Mouden, 2013).

In humans, a growing body of evidence has consistently shown that people make risky decisions that conform to the predictions of risk-sensitivity theory in multiple domains (Deditius-Island, Szalda-Petree, & Kucera, 2007; Ermer et al., 2008; Rode, Cosmides, Hell, & Tooby, 1999; Mishra, Barclay, & Lalumière, 2014; Mishra & Fiddick, 2012; Mishra, Gregson, & Lalumière, 2012; Mishra & Lalumière, 2010; Pietras & Hackenberg, 2001; Pietras, Locey, & Hackenberg, 2003; Searcy & Pietras, 2011; Wang, 2002). In all of these studies, people engaged in greater risk-taking as the disparity between their present and desired (or goal) states increased. For example, Mishra, Gregson, et al. (2012) demonstrated that people who were given a target goal for returns on financial investments chose riskier options when these target goals were higher compared to when they were lower. Risk-sensitive decision making has been demonstrated to occur independent of stable individual differences in personality (Mishra & Lalumière, 2010) and has been demonstrated for both decisions from description (i.e., decisions made from explicit descriptions of possible outcomes) and decisions from experience (i.e., decisions made from implicit learning of possible outcomes; Mishra, 2014).

Importantly, risk-sensitivity theory does not posit that decision makers explicitly calculate the costs and benefits of every decision made and only choose risky options if they are able to exceed their goal or desired state. This mechanism would be implausible given that most decisions are made under some condition of uncertainty (i.e., all decision options and explicit outcome probabilities are rarely known to real-world decision makers; Knight, 1921). Rather, most decision making should occur through applications of simple heuristics—decision mechanisms that involve quick and simple computations and are general enough to be applicable in stochastic environments (i.e., decisions reflect “bounded” rationality; Gigerenzer & Gaissmaier, 2011; Gigerenzer, Todd, & the ABC Research Group, 1999; Todd & Gigerenzer, 2000, 2012). Mishra (2014) specifically suggested that risk-sensitivity is a product of a simple satisficing decision-making heuristic: If one is in a

situation of high need (i.e., in a situation of disparity between their present and desired states), they should be more risk-prone (i.e., variance preferring). If this simple heuristic account holds, decision makers should exhibit a general heightened preference for high-variance risky outcomes under conditions of need.

Inequality by definition describes disparity between one's own state and the state of others. Seeing others better off than one's self can lead to raised expectations for one's own possible outcomes (Collins, 1996). Therefore, risk-sensitivity theory leads to the prediction that victims of inequality should engage in greater risk-taking because they are at distance from the position of more privileged others. That is, people who are victims of inequality experience disparity between their present and desired states and should thus exhibit greater risk-taking. Risky behaviors have the potential for high payoffs. As a consequence, for victims of inequality, risk-taking may offer means for pursuing desirable outcomes that would otherwise be unavailable or unattainable with low-risk behaviors (Callan et al., 2008; Daly & Wilson, 2001; Mishra, 2014; Mishra & Lalumière, 2010).

### *Other Approaches to Understanding Inequality and Risk*

Risk-sensitivity as a framework for understanding risk-taking behavior in humans is relatively new (Mishra, 2014). As a consequence, it is worth comparing the predictions of risk-sensitivity theory regarding an inequality–risk link with the predictions of other prominent frameworks for understanding risk. The dominant frameworks used to explain decision making under risk are expected utility theory (Friedman & Savage, 1948, 1952) and prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), both developed in the finance and economics field.

Expected utility theory posits that people seek to maximize utility in their decisions, where utility describes happiness, gratification, or satisfaction derived from a behavior (Friedman & Savage, 1948, 1952). A key principle of expected utility theory in its canonical form is consistency of risk-preference, which posits that each individual behaves in accordance with a single utility function that quantifies stable individual differences in risk-proneness or risk-aversion (von Neumann & Morgenstern, 1944). As a consequence, expected utility theory would not predict that people would shift their level of risk-taking as a product of such environmental or situational inputs as inequality. Rather, expected utility theory would predict that people would make decisions consistent with their own utility curve for risk across all circumstances. Although expected utility theory remains highly influential, consistent violations of the theory have been identified, and it is widely seen as flawed, especially outside of economics (reviewed in Mishra, 2014).

Prospect theory was developed to better explain consistently observed empirical violations of expected utility theory, the most prominent of which is the framing effect (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). The framing effect describes the tendency for people to be risk-prone when

faced with losses, and risk-averse when faced with gains, where losses and gains are anchored around a “reference point” (Tversky & Kahneman, 1981). Prospect theory makes the same predictions regarding the inequality–risk link as risk-sensitivity theory if one's reference point is considered to be the relative state of others. Victims of inequality may consider themselves to be in a situation of loss compared to more privileged others, and elevate risk-taking as a consequence. However, it is worth noting that previous research examining the overlap between risk-sensitivity theory and prospect theory (by forcing empirical tests of competing assumptions) suggests that prospect theory decision preferences may be better conceptualized as products of risk-sensitivity, where people create psychological goal states based on relevant situational inputs and make risk-sensitive decisions accordingly (Mishra & Fiddick, 2012; Wang, 2002).

The empirical finance and economics literature has examined inequality extensively, although little work has specifically examined the link between inequality and risk-taking. Extant research has shown that people are highly averse to inequality (e.g., Fehr & Schmidt, 1999; Kroll & Davidovitz, 2003). People also exhibit the status quo bias, which describes baseline preference for a current state of affairs (Kahneman, Knetsch, & Thaler, 1991). Several studies suggest that people are acutely sensitive to aspiration levels, which may be considered analogous to reference points in prospect theory or need thresholds in risk-sensitivity theory (e.g., Heath, Larrick, & Wu, 1999; Koszegi & Rabin, 2006; March & Shapira, 1992; Mishra & Fiddick, 2012). Some research further suggests that the outcomes of others serve as inputs into the computation of these aspiration levels/reference points/need thresholds and affect risky decision making (e.g., Knudsen, 2008; Linde & Sonnemans, 2015; March, 1988; Rohde & Rohde, 2011). These findings are relevant to the current study in that they suggest that people are intolerant of inequality (which is a violation of the status quo of assumed egalitarianism) and sensitive to reference points, which are often determined by the outcomes of others. However, no research, to our knowledge, has directly examined whether people elevate risk-taking as a response to inequality at the individual level.

### *Overview*

The present research consists of two experiments exploring whether economic inequality affects risk-taking behavior at the individual level. In Experiment 1, we examined whether being the victim of inequality led to increased risk-taking. In Experiment 2, we examined whether elevated risk-taking as a consequence of being victimized by inequality could be eliminated through the amelioration of inequality.

These experiments extend previous research in three important ways. First, we directly examine the effect of economic inequality on risk-taking. Previous work has largely focused on examining whether downstream proximate emotional consequences of inequality (e.g., anger/frustration) affect risk-taking (e.g., Callan et al., 2008; Fessler et al., 2004; Leith & Baumeister, 1996). No research, to our

knowledge, has directly manipulated economic inequality and measured its influence on more general risk-taking behavior. Second, we examine whether inequality is associated with a heightened preference for risk, as measured by behavioral preference for outcome variance controlling for expected value. Previous research has examined instantiations of risk-taking that did not explicitly measure variance preference controlling for expected value (e.g., Callan et al., 2008; Greenberg, 1993). Finally, we examine the degree to which the inequality–risk relationship is causal by experimentally investigating whether the presence of inequality motivates increased risk-taking and the subsequent amelioration of inequality motivates decreased risk-taking.

## Experiment 1

In Experiment 1, participants were manipulated to be victims of inequality, beneficiaries of inequality, or to have not experienced inequality at all. Consistent with risk-sensitivity theory, we predicted that victims of inequality would engage in higher risk-taking compared to beneficiaries of inequality and those experiencing no inequality. That is, those who are in conditions of high need—disparity between their present and desired states—would show a general increased preference for high-variance outcomes. Under such circumstances of need as inequality, risk-taking might be the only option leading to outcomes not otherwise available to those who are victimized. We used a dependent measure of risk-taking—the Choice Task (Mishra & Lalumière, 2010; adapted from Fessler et al., 2004)—that quantifies general preference for variability in monetary outcomes controlling for expected value.

## Method

One hundred and six participants recruited from a university psychology participant pool (age:  $M = 20.1$ ,  $SD = 2.5$ , range = 18–34; 49 women, 48 men; 9 unrecorded) were run in same-sex pairs.<sup>1</sup> Participants with missing values for risky choice ( $n = 5$ ) were not included in the analyses. The experiment was advertised as a personality study offering bonus course marks. The advertisement did not specify any possibility of monetary payment. After arriving at the laboratory, participants were seated in close proximity on a couch. Participants were randomly assigned to either the experimental condition (24 pairs) or one of two control conditions: a no-payment condition (16 pairs) or a CAD\$10-payment condition (13 pairs).

Participants arriving at the laboratory were given a brief introduction along with a consent form to complete. In the experimental condition, one participant was given CAD\$10 and the other nothing. These payments were provided with the following rationale: “We received some extra funding for this study, so we are now able to provide CAD\$10 to half of all of the study participants. We can only pay some participants because of specific funding restrictions dictating that only a certain number of participants can be paid.” Before each

**Table 1.** The Choice Task Description and Options Presented to Each Participant [in random order, one at a time]. Instruction: “You will now see six pairs of choices between different monetary options. For each, please indicate which you would prefer.”

Safe Option	Risky Option
CAD\$3.00 guaranteed	80% probability (8/10) of receiving CAD\$3.75
CAD\$3.00 guaranteed	60% probability (6/10) of receiving CAD\$5.00
CAD\$3.00 guaranteed	40% probability (4/10) of receiving CAD\$7.50
CAD\$3.00 guaranteed	30% probability (3/10) of receiving CAD\$10.00
CAD\$3.00 guaranteed	20% probability (2/10) of receiving CAD\$15.00
CAD\$3.00 guaranteed	10% probability (1/10) of receiving CAD\$30.00

session, the experimenter randomly determined via a coin flip whether the first or second participant to arrive received CAD\$10. In the no-payment control condition, both participants received no payment, and no mention of payment was ever made. In the CAD\$10-payment control condition, both participants were given CAD\$10 and told that payment was offered due to extra funding.

Following payments, each participant was directed to a private testing room, where they completed the dependent measure of risk-taking, the Choice Task, which was presented randomly among the following exploratory individual differences measures: A brief measure of sensation-seeking (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002), Eysenck’s Impulsivity Scale (Eysenck, Pearson, Easting, & Allsopp, 1985), the Justice Sensitivity Scale (Schmitt, Gollwitzer, Maes, & Arbach, 2005), and the Personal Relative Deprivation Scale (Callan et al., 2008).<sup>2</sup> In the Choice Task, participants made six risk-sensitive decisions, each between two monetary options (Table 1; Mishra & Lalumière, 2010, adapted from Fessler et al., 2004). For each decision, both options had equal expected values, but differed in payoff outcome variance. The six Choice Task decisions were presented one at a time in random order to each participant. Participants were told the following: “Please make your decisions as honestly as possible. At the end of the study, we will randomly choose one of the decisions you made, and you will earn any money associated with that decision.” All measures were administered through software programmed in Visual Basic. Total number of risky choices made was recorded by the software and served as the dependent measure.

At the conclusion of the experimental session, one of the participant’s six responses was then randomly chosen. The choice made was then simulated (i.e., if a probabilistic choice was chosen—e.g., a 10% chance of CAD\$30—a computer simulation determined the outcome) and the participant received the value of the choice they made in cash. Participants were thoroughly debriefed following the experiment. Those who were victims of inequality or in the no-payment control condition received an additional CAD\$10 (to match the CAD\$10 payments made to participants who were beneficiaries of inequality or in the CAD\$10-payment control condition). All participants also received bonus marks for their participation.

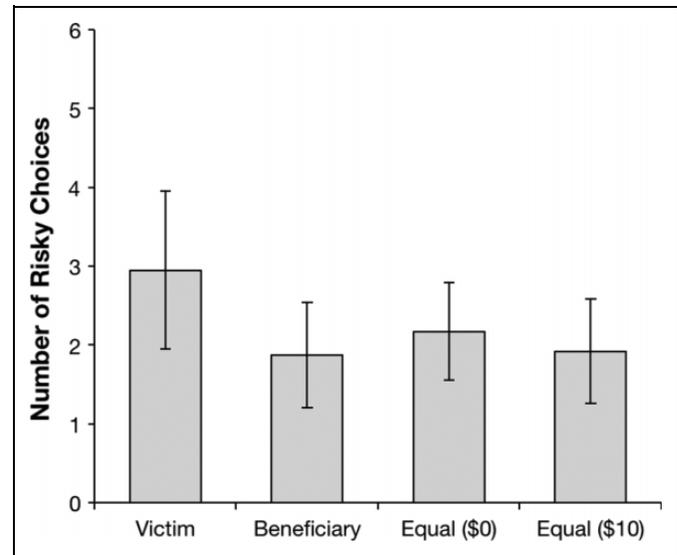
## Results and Discussion

To examine the effect of outcome and inequality on risk-taking, we conducted a planned-comparison contrast analysis (Rosenthal, Rosnow, & Rubin, 2000) to test our prediction that participants who were in the low outcome/unequal to partner condition (i.e., victims of inequality) should engage in significantly higher risk-taking compared to participants in the other three conditions: low outcome/equal to partner (i.e., those who received equal CAD\$0 payments), high outcome/unequal to partner (i.e., beneficiaries of inequality), high outcome/equal to partner (i.e., those who received equal CAD\$10 payments; 3 vs. 1 contrast test). The dependent variable was the total number of risky choices participants made (ranging from zero to six). This contrast test showed that participants who were victims of inequality engaged in significantly greater risk-taking than participants who were beneficiaries of inequality or those who did not experience inequality,  $F(1, 99) = 5.02, p = .027, \eta^2 = .048$ ;  $M_{\text{victim}} = 2.95$ , 95% confidence interval (CI) [1.95, 3.95];  $M_{\text{beneficiary}} = 1.87$ , 95% CI [1.20, 2.54];  $M_{\text{equal-}\$0} = 2.17$ , 95% CI [1.55, 2.79];  $M_{\text{equal-}\$10} = 1.92$ , 95% CI [1.26, 2.59]. Follow-up directional  $t$ -tests indicated that victims of inequality engaged in significantly greater risk-taking compared to beneficiaries of inequality,  $t(43) = -1.89, p = .033, d = .58$ , 95% CI [-2.24, .074], and those in the CAD\$10-payment condition,  $t(46) = 1.83, p = .037, d = .54$ , 95% CI [-.11, 2.17], and near significantly compared to those in the CAD\$0-payment condition,  $t(50) = 1.45, p = .077, d = .41$ , 95% CI [-.30, 1.88]. These results are summarized in Figure 1.

In Experiment 1, victims of inequality engaged in greater risk-taking compared to those who were beneficiaries of inequality and those who did not experience inequality in outcomes. These results indicate that being the victim of inequality leads to elevated risk-taking, rather than being the beneficiary of inequality leading to suppressed risk-taking. This observation is further supported by previous research showing that the mean level of risk-taking in the Choice Task among similar participants in a control condition is approximately two risky choices out of six (Mishra, Lalumière, & Williams, 2010). However, it is important to note that finer analyses indicated that victims of inequality did not engage in significantly greater risk-taking than those who were in the equal-CAD\$0 payment condition. Thus, we cannot decisively rule out the possibility that people engaged in greater risk-taking when not paid. These results were likely influenced by the limited power of these analyses. Still, together, these results suggest that victims of inequality engage in greater risk-taking at the individual level.

## Experiment 2

If risk-taking is an acute response to situations involving victimization by inequality, then people should be sensitive to relatively immediate changes in inequality. Risk-taking carries high potential costs, and so decision makers should



**Figure 1.** Number of risky choices on the Choice Task (CT;  $M \pm 95\%$  confidence interval) as a function of inequality condition.

avoid such costs whenever possible. Risk-sensitivity theory predicts that people should not be risk-seeking if they are able to obtain desired outcomes through the choice of non-risky options. Therefore, in Experiment 2, we examined whether eliminating conditions of inequality would lead to corresponding reductions in risk-taking. Specifically, we examined whether participants' risk-taking increased after experimentally inducing inequality and decreased after this inequality was either ameliorated or maintained. We predicted that being the victim of inequality (vs. the beneficiary of inequality) would motivate elevated risk-taking, replicating the results of Experiment 1. We also predicted that victims of inequality who experienced amelioration of inequality would engage in subsequently lower risk-taking, whereas those who had their experience of inequality maintained would exhibit no change in risk-taking.

## Method

One hundred and four participants recruited from a university psychology participant pool (48 women, 48 men, age:  $M = 20.3, SD = 2.3$ , range = 18–28; 8 unrecorded) were run in same-sex pairs. Participants with missing values for risky choice ( $n = 2$ ) were not included in the analyses. The experiment was advertised as a two-part personality study offering research credit. No monetary compensation was advertised. After arriving at the laboratory, participants were seated in close proximity on a couch. Participants were randomly assigned to either the inequality-amelioration condition (26 pairs) or the inequality-maintenance condition (26 pairs).

For all participants, inequality was induced as in Experiment 1 (using asymmetrical CAD\$0/\$10 payments randomly determined before the experimental session). Following payment,

each participant was directed to a computer in a private testing room, where they completed the dependent measure of risk-taking, the Choice Task (Mishra & Lalumière, 2010, adapted from Fessler et al., 2004), presented randomly among two of the individual differences measures described in Experiment 1. The six Choice Task decisions were presented one at a time in random order to each participant. Participants were told that they would receive the outcome associated with one of their decisions (to be determined randomly). However, participants were given no indication of the possibility of future payments later in the experiment.

After completing the first administration of the Choice Task, participants called the researcher into their testing room. One of the participant's six responses on the Choice Task was then randomly chosen and simulated. If the participant was to receive payment, it was noted on paper, and the participant was told that they would receive payment at the end of the entire experimental session. Participants then emerged from their testing rooms and were reseated in close proximity on the couch. The experimenter then told participants the following: "As you know, you signed up to participate in a two-part study. We will now begin the second part of the study involving a different research question." At this point, the stability of inequality manipulation was introduced.

In the inequality-amelioration condition, participants were given asymmetrical CAD\$0/\$10 payments as in the beginning of the experiment, except the recipient of the CAD\$10 was reversed: The initial recipient of CAD\$10 received nothing, and the initial victim of inequality (who originally received CAD\$0) received CAD\$10. Participants were told the following: "The second part of the study has similar funding restrictions to the first part of this study based on numbers of participants. But, because we want to make things as fair as possible, we ran these two studies together. We will now reverse the payments from the first study so that you both leave with the same amount of money." Following the second set of payments, participants were directed into separate testing rooms where they completed a second administration of the Choice Task along with two of the individual differences measures described in Experiment 1. In the inequality-maintenance condition, participants were not told about any additional payments, and a second set of payments was not made (i.e., initial induced inequality was maintained). All measures were administered through software programmed in Visual Basic. Total number of risky choices was computed separately for the first and second administration of the Choice Task by the software and served as the dependent measures.

After completing the second phase of the study, participants emerged again from their testing rooms. All participants were thoroughly debriefed following the experiment. Initial victims of inequality for whom inequality was not ameliorated received an additional CAD\$10 after the experiment was completed to match the CAD\$10 payments made to participants in the other conditions. Finally, all participants received the total amount of their earnings in cash across the two administrations of the Choice Task. All participants also received bonus marks for their participation.

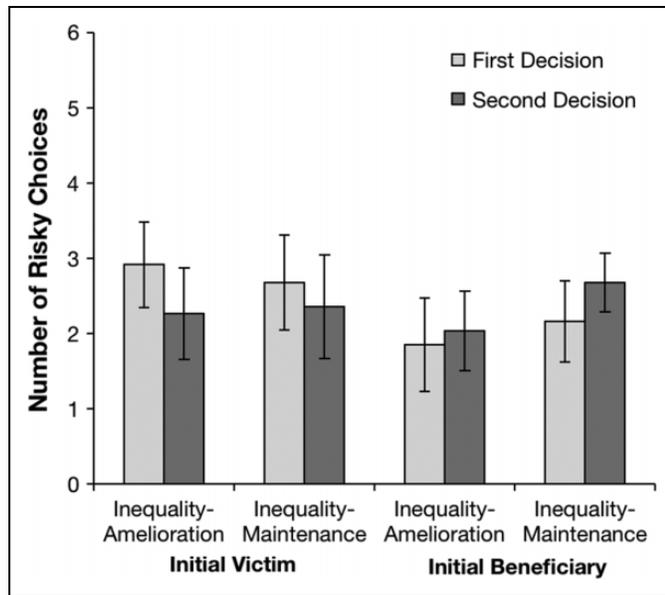
## Results and Discussion

At the point of first administration of the Choice Task, all participants were induced to be either victims of inequality or beneficiaries of inequality. Initial victims of inequality engaged in greater risk-taking than initial beneficiaries of inequality,  $t(100) = 2.83, p = .0056, d = .57; M_{\text{victim}} = 2.80, 95\% \text{ CI } [2.39, 3.21]; M_{\text{beneficiary}} = 2.00, 95\% \text{ CI } [1.60, 2.40]$ . These results replicate those of Experiment 1.

At the point of the second administration of the Choice Task, participants had just had their initial experience of inequality maintained (inequality-maintenance condition) or ameliorated (inequality-amelioration condition). An inequality condition (victim/inequality-maintenance, beneficiary/inequality-maintenance, victim/inequality-reduction, beneficiary/inequality-reduction) by decision order (first risky choice, second risky choice) mixed analysis of variance was conducted. As predicted, a significant interaction between decision order and inequality condition was observed,  $F(3, 98) = 3.85, p = .012, \eta^2 = .11$ . Follow-up repeated measures  $t$ -tests were used to examine temporal changes in risk-taking across the two administrations of the Choice Task.

Initial victims of inequality whose experience of inequality was ameliorated exhibited significantly lower risk-taking following amelioration of inequality,  $t(25) = 2.35, p = .021, d = .94, 95\% \text{ CI of difference } [.11, 1.20]; M_{\text{CT1}} = 2.92, 95\% \text{ CI } [2.35, 3.49]; M_{\text{CT2}} = 2.27, 95\% \text{ CI } [1.66, 2.88]$ ; CT1 = first risky choice, CT2 = second risky choice. Initial victims of inequality whose experience of inequality was maintained exhibited no significant change in risk-taking,  $t(24) = 1.25, p = .22, d = .51, 95\% \text{ CI of difference } [-.21, .85]; M_{\text{CT1}} = 2.68, 95\% \text{ CI } [2.05, 3.31]; M_{\text{CT2}} = 2.36, 95\% \text{ CI } [1.67, 3.05]$ . No significant change in risk-taking was observed among initial beneficiaries of inequality in the inequality-amelioration condition,  $t(25) = -.69, p = .49, d = .28, 95\% \text{ CI of difference } [-.76, .38]; M_{\text{CT1}} = 1.85, 95\% \text{ CI } [1.23, 2.46]; M_{\text{CT2}} = 2.04, 95\% \text{ CI } [1.51, 2.57]$ . Similarly, no significant change in risk-taking was observed for initial beneficiaries of inequality in the inequality-maintenance condition,  $t(24) = -1.96, p = .062, d = .80, 95\% \text{ CI of difference } [-1.07, .028]; M_{\text{CT1}} = 2.16, 95\% \text{ CI } [1.62, 2.70]; M_{\text{CT2}} = 2.68, 95\% \text{ CI } [2.29, 3.07]$ . The results of Experiment 2 are summarized in Figure 2.

Initial victims of inequality engaged in less risk-taking in the second administration of the Choice Task in both the inequality-amelioration and inequality-maintenance conditions, although this effect was only statistically significant in the inequality-amelioration condition. However, the magnitude of the decline in risk-taking in the inequality-amelioration condition was not significantly greater than that in the inequality-maintenance condition,  $t(49) = .37, p = .37, d = .11, 95\% \text{ CI of difference } [-.41, 1.08]$ ; CT difference:  $M_{\text{amelioration}} = -.65; M_{\text{maintenance}} = -.32$ . This result suggests that risk-taking in the inequality-amelioration condition may have declined as a product of amelioration of inequality in combination with the passage of time. The limited power of this analysis may also



**Figure 2.** Number of risky choices on the Choice Task (CT;  $M \pm 95\%$  confidence interval) among individuals who were initial victims and beneficiaries of inequality in the inequality-amelioration and inequality-maintenance conditions. Risky choices made in the first and second administrations of the Choice Task are represented by light and dark gray bars, respectively.

explain this result. Regardless, the results, although suggestive, must be interpreted with some caution.

The results of Experiment 2 demonstrate that victims of inequality engage in greater risk-taking compared to other participants, replicating the results of Experiment 1. Furthermore, the results of Experiment 2 demonstrate that ameliorating inequality can help to reduce the initial effects of inequality on risk-taking for its victims. The effects of inequality on risk-taking for its victims were eliminated on a short time frame, suggesting that real-world effects of inequality on risk-taking may be remedied through changes in the experience of inequality. Furthermore, the amelioration of inequality had no statistically significant adverse effects on the initial beneficiaries of inequality. Together, these results suggest that inequality may have a causal effect on risk-taking.

## General Discussion

The results of two experiments indicated that victims of inequality engaged in greater financial risk-taking compared to beneficiaries of inequality and non-victims of inequality. The effect of inequality on risk-taking was demonstrably plastic: Eliminating the initial experience of inequality among victims contributed to subsequent reductions in risk-taking. These findings suggest that the relationship between economic inequality and risk-taking at the societal level may be in part explained by a link between the experience of economic inequality and risk-taking at the individual level. These findings also provide further support for risk-sensitivity theory.

Previous research in psychology has typically characterized risk-taking as irrational, reckless, or self-defeating (e.g., Leith & Baumeister, 1996; Pham, 2007; Sen, 1990). This characterization is based on a definition of rationality as the pursuit of self-interested behavior, with the argument that risk-taking and its associated costs run counter to self-interest. Risk-sensitivity theory provides an alternative, less pejorative account of risk-taking as a form of rational behavior. Risk-sensitivity theory specifically posits that decision makers should prefer high-risk options in circumstances where low-risk options are unlikely to meet fitness-relevant goals (Mishra, 2014; Stephens, 1981). Victims of inequality are by definition in a situation of disparity, at distance from the state of more privileged others and thus losing in the competition for fitness-relevant outcomes. As a consequence, risk-taking may be an adaptive response for victims of inequality: Risk-taking may be the only option leading to outcomes not otherwise available. The results of this and several other studies have shown that people (and many nonhuman animal species) adjust their level of risk-acceptance in accordance with environmental conditions, providing support for the hypothesis that risk-taking is an adaptive response to certain situational or environmental conditions (reviewed in Mishra, 2014).

Risk-sensitivity theory is not necessarily the only theory that can account for our results. Prospect theory suggests that people are risk-prone when facing losses, and risk-averse when facing gains (i.e., people exhibit the “framing effect”; Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). In prospect theory, gains and losses are determined around a reference point. If participants who were victims of inequality used others’ CAD\$10 income as their reference point, it is possible that they considered themselves to be in a situation of relative loss, and therefore engaged in risk-prone behavior as a consequence. Similarly, an anchoring and adjustment account suggests that victims of inequality may have anchored on the CAD\$10 amount that beneficiaries received and used this amount to inform their subsequent decision making. We do note, however, that there is empirical evidence suggesting that risk-sensitivity theory provides a broader normative rationale for framing effects (Mishra, 2014; Mishra & Fiddick, 2012).

Victims of inequality are in a situation of disparity and so experience competitive disadvantage compared to more privileged others. Our results are consistent with research suggesting that people in situations of competitive disadvantage engage in greater risk-taking. People are more likely to engage in risky aggressive and criminal conduct if they are unsuccessful (or expect themselves to be unsuccessful) in social or economic competition (Hill & Buss, 2010; Mishra et al., 2014; Raphael & Winter-Ebmer, 2001; Wohl, Branscombe, & Lister, 2013). Those with lower income relative to others are also significantly more likely to spend a large proportion of their income on more risky gambling behavior, including the purchase of lottery tickets (Blalock, Just, & Simon, 2007; MacDonald, McMullan, & Perrier, 2004; Welte, Wiczorek, Barnes, & Tidwell, 2006).

To what extent might economic inequalities induced by an experimenter generalize to those experienced by people in their daily lives? The knowledge that inequality based on race, for example, is in part a historical byproduct of lack of opportunity for marginalized groups likely does not make any present experience of inequality any less negative or undesirable. In everyday situations, victims of inequality would experience persistent feedback emphasizing victimization (e.g., racial discrimination), potentially leading to consistent engagement in risky behavior. It is possible that some persistent individual differences in risk-propensity may not necessarily be a product of stable personality traits, but rather a product of the persistent experience of inequality. Buss and Greiling (1999) used the term “enduring situational evocation” to describe such patterns of behavior. We have recently collected some evidence suggesting that people who appear to exhibit high baseline levels of risk-acceptance (e.g., delinquents, ex-convicts, drug and gambling addicts) are sensitive to more acute changes in inequality and environmental cues of need in a laboratory setting, adjusting their risk-acceptance accordingly (Mishra, Lalumière, Williams, & Daly, 2012).

Risk-taking is part of a suite of behaviors affected by inequality. Wilkinson and Pickett (2009) review substantial evidence indicating that various outcomes associated with social life, health, and well-being are linked to inequality, including crime, substance abuse, obesity, and reduced trust and community life. Although these results have been shown at the societal level, growing evidence suggests that relative disparity has psychological influence at the individual level as well. Perception of inequality has been linked with such negative consequences as physical stress (Walker & Mann, 1987), negative moods including unhappiness and frustration, and poorer physical and mental health (Clark, Frijters, & Shields, 2008; Lorant et al., 2003; Luttmer, 2005; Mishra & Carleton, under review; Pickett & Wilkinson, 2010; reviewed in Wilkinson & Pickett, 2009). More broadly, recent comparative evidence suggests that monkeys and dogs also react negatively to conditions of inequality, suggesting potential early evolutionary origins to inequality aversion (Brosnan & de Waal, 2003; Range, Horn, Viranyi, & Huber, 2009).

### Limitations

This study has several limitations that provide directions for future research. The generalizability of our results is unclear for several reasons. First, our sample consisted only of relatively privileged university students who have probably not been exposed to systemic economic inequality. Compared to more general populations, undergraduates are wealthier and more educated on average (Henrich, Heine, & Norenzayan, 2010). Regardless of socioeconomic background, however, it is likely that most people are sensitive to the experience of inequality due to the broadly relevant effects of social comparison (Frank, 2000, 2007; Wilkinson & Pickett, 2009).

Second, the generalizability of our results is also restricted due to the limited statistical power in this study. A higher-powered replication of this study among more diverse populations is necessary to demonstrate the generality and reliability of our findings. Finally, any elicitation of risk preferences in a laboratory setting will necessarily have limited external validity. The Choice Task, although simple, may not be the most ideal instrument to measure risk preferences (e.g., Charness, Gneezy, & Imas, 2013; Sparks, Mishra, Rotella, & Barclay, under review). Further examination of the replicability of our results is necessary with other measures of risk-taking to better understand generalizability, reliability, and external validity.

In the inequality conditions, pairs of participants received asymmetrical CAD\$10/\$0 payments even though the money could have been divided equally. Victims of inequality may have therefore perceived a violation of procedural justice (fairness in the domains of dispute resolution and resource allocation; Lind & Tyler, 1988; Tyler, Degoe, & Smith, 1996). Procedural justice considerations may have consequently influenced risk-taking to some degree. This potential perceived violation of procedural justice may have been further exacerbated by instructions that highlighted (un)fairness (i.e., these instructions may have primed participants to pay particular attention to fairness issues). It would be beneficial to examine the degree to which perceptions of procedural justice in the context of inequality (i.e., perceptions of “fair” vs. “unfair” processes producing inequality) influenced decision making.

The mean level of risk-taking among victims of inequality across both experiments was approximately three risky choices (out of six) on the Choice Task. There are at least two possible alternative explanations for why we observed this level of risk-taking among victims of inequality. First, victims of inequality may have only selected risky options that allowed them to reach the threshold set by payment to the beneficiary of inequality. That is, victims of inequality may have only selected risky options that offered an expected value of greater than or equal to CAD\$10 (of which there were three options). Second, if victims of inequality stopped caring about (or paying attention to) the task and made choices randomly, we would expect to observe a mean level of risk-taking of approximately three risky choices (out of six) on the Choice Task. Mean number of risky choices was indeed close to three for victims of inequality across both experiments. Because our programmed task only recorded the sum total of risky choices made in the Choice Task, it is impossible to conduct finer analyses to examine these hypotheses. Future research should examine the specific risky choices made by participants to determine whether people tend to favor risky options that allow them to exceed the expected value of a competitor’s earnings. It would also be interesting to examine whether people would make different choices if the expected value of options in the Choice Task varied (all options had an expected value of CAD\$3 in the reported experiments) or if risky options had greater downside costs (e.g., exposure to potential losses).

The transparency of the manipulations used in this study may have been problematic. Many undergraduate psychology students participate in experimental studies expecting to be deceived or given false feedback. Participants may have thus discounted the inequality manipulations. We did not include an attention check to examine this possibility. Following debriefing at the end of the study, some participants indicated that they had indeed suspected that the systemic inequality manipulation (CAD\$10/\$0) was a deliberate manipulation. At the same time, some participants exhibited legitimate concern that the experimenter would be treating students so unfairly regarding asymmetrical payments, and some exhibited visible signs of being upset before being debriefed. We note, of course, that all participants were thoroughly and carefully debriefed at the end of each study.

This study does not explicate the proximate mechanisms that link inequality with increased risk-taking. Inequality facilitates such negative emotions as anger, annoyance, and frustration (e.g., Dawes, Fowler, Johnson, McElreath, & Smirnov, 2007). These affective responses to inequality have been in turn linked with increased risk-taking behavior (e.g., Callan et al., 2008; Fessler et al., 2004; Leith & Baumeister, 1996). Future studies should examine what proximate mechanisms moderate or mediate the relationship between inequality and risk-taking behavior.

## Conclusions

The results of this study suggest that inequality may play a causal role in motivating risk-taking for its victims at the individual level. The effect of inequality on risk-taking manifested in short time frames, suggesting that inequality is a salient motivator of risk-taking to which people are acutely sensitive. In everyday situations, it is possible that victims of inequality would experience persistent feedback emphasizing such inequalities (e.g., repeated group-based discrimination, stigmatization of the poor), potentially leading to even greater elevation of risk-taking. That inequality has been so robustly associated with various forms of risk-taking at the societal level (Wilkinson & Pickett, 2007, 2009) supports this hypothesis. This study has important policy implications: Aiming to affect modifiable circumstances that motivate risk-taking, such as inequality in access to health care, education, wealth, and other opportunities, may lead to significant reductions in risky behavior.

## Declaration of Conflicting Interests

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## Notes

1. Participants self-reported gender in a brief biographic questionnaire. Those who did not do so are noted here as unrecorded.
2. None of these measures were directly relevant to our planned analyses. When included in the analyses below as covariates, none of these individual differences measures were significant (all  $F$ s < .25,  $p$ s > .62), and so we do not discuss them further.

## Supplemental Material

The online appendices are available at <http://evp.sagepub.com/supplemental>

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