



Short Communication

Compensation method affects risk-taking in the Balloon Analogue Risk Task

Anne E. Ferrey^a, Sandeep Mishra^{b,*}^a Yale University, United States^b University of Regina, Canada

ARTICLE INFO

Article history:

Received 23 September 2013

Received in revised form 4 February 2014

Accepted 6 February 2014

Keywords:

Balloon Analogue Risk Task

Compensation

Participant payment

Risk-taking

Motivation

ABSTRACT

Different participant compensation methods may have discrepant effects on decision-making in behavioral measures of risk-taking. Participants in clinical samples tend to receive session-based payment (often in conjunction with decision-based payment), whereas participants in student samples generally receive decision-based payment or no payment at all. This study examined the effect of different methods of participant payment on a behavioral measure of individual differences in risk-taking. Participants completed the Balloon Analogue Risk Task (BART) as well as questionnaire measures of sensation-seeking and impulsivity. Participants who received session-based payment engaged in significantly greater risk-taking in the BART compared to those who were paid based on their decisions and those who were not paid at all (i.e., those who were only compensated with course credit). These effects were not influenced by age, gender, sensation-seeking or impulsivity. These findings provide evidence that different compensation methods significantly influence participants' risk-taking propensity as measured by the BART.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

People exhibit substantial individual differences in risk-taking propensity. These individual differences are a product of both variability in personality traits (e.g., sensation-seeking, impulsivity; reviewed in Zuckerman, 2007), and variability in situational and/or environmental circumstances (e.g., conditions of need; Mishra & Lalumière, 2010). Other factors such as age and gender have also been consistently associated with risk-taking: On average, men tend to engage in greater risk-taking than women (Byrnes, Miller, & Schafer, 1999), and younger people tend to engage in greater risk-taking than older people (e.g., Steinberg, 2007).

1.1. The Balloon Analogue Risk Task

The Balloon Analogue Risk Task (BART) is a behavioral laboratory measure of individual differences in risk-taking (Lejuez et al., 2002). The BART is a computer-based task in which participants pump up an animated balloon, with a monetary reward for each pump. At any point the participant may decide to collect their earnings, at which point the accumulated cash is saved in a cumulative bank. However, each balloon is set to explode at random,

with the result of loss of all money accumulated for that balloon. Therefore, while each additional pump increases the reward associated with a particular balloon, it also increases the risk that it will explode and all accumulated money will be lost. Risk-taking in the BART is quantified by the average number of pumps delivered in balloons that did not pop (Lejuez et al., 2002).

Risk-taking in the BART has been associated with numerous forms of real-world risk-taking. People with conduct disorder and substance use disorder engage in greater risk-taking in the BART (Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2006), as do users of cigarettes, alcohol, and other illicit drugs (e.g., Lejuez et al., 2003; Fernie, Cole, Goudie, & Field, 2010). In adolescents, BART scores have been associated with such real-world risky behaviors as cigarette, alcohol and drug use, gambling, aggression, and sexual risk-taking (Lejuez, Aclin, Zvolensky & Pedulla, 2003; Lejuez, Simmons, Aclin, Daughters, & Dvir, 2004). The BART has also been associated with individual differences in personality. Risk-taking in the BART has been positively associated with trait impulsivity and sensation-seeking in student and community populations, although inconsistently (reviewed in Lauriola, Panno, Levin, & Lejuez, 2014).

1.2. Compensation and risk-taking

Participants in experimental studies are typically compensated with course credit (in research involving student populations) or

* Corresponding author. Address: Faculty of Business Administration, University of Regina, Regina, Saskatchewan S4S 0A2, Canada. Tel.: +1 (306) 585 4783.

E-mail address: mishrs@gmail.com (S. Mishra).

monetary payment. Studies involving student populations tend to utilize course credit, whereas monetary payment is more commonly used for clinical and community samples. In most studies involving monetary compensation, payment is session-based and contingent on the simple completion of a study. However, in decision-making studies, monetary payment is typically based on participants' actual decisions during experimental tasks (often in conjunction with session-based payment). Differences in compensation method may influence experimental outcomes, especially in studies involving decision-making tasks.

In the present study, we examined whether different compensation methods affected risk-taking in the BART. Three groups of participants completed the BART and questionnaire measures of individual differences in trait impulsivity and sensation-seeking. The first group was given monetary compensation based only on actual decisions made in the BART. The second group received payment for completing the entire experimental session, as well as payment for actual decisions made in the BART. The third group was given no monetary compensation, but received course credit. We also measured individual differences in impulsivity and sensation-seeking given evidence linking these traits to risk-taking in the BART (Lauriola et al., 2014).

In general, people are more sensitive to losses than gains: if the only money they will receive is that which is banked during the BART, they are likely to adopt a loss-averse strategy and cash in their balloons earlier rather than risk an explosion by continuing to try and earn more money (Fukunaga, Brown, & Bogg, 2012). Participants who were paid for their actual decisions on the BART should therefore engage in relatively lower risk-taking because high levels of risk-taking would lead to unnecessary exposure to loss. Participants who were paid a flat-rate amount for completing the experimental session have nothing to lose. They are guaranteed payment no matter how they respond in the BART, and are free to act as risk-prone as desired because there is no possibility of loss. Participants who were paid a flat rate for experimental participation should therefore engage in relatively higher risk-taking. Finally, participants who are not paid at all should also perceive themselves as having nothing to lose and engage in relatively higher risk-taking.

2. Materials and methods

2.1. Participants and conditions

Participants were 125 men and 157 women (Age: $M = 20.8$, $SD = 2.9$). All participants completed a brief biographic questionnaire, the Balloon Analogue Risk Task (BART), and two measures of individual differences in personality associated with risk-taking (described in detail below). Participants also completed other measures that were unrelated to the present study. The order of measure presentation was randomized for each participant. Participants were in one of three conditions. In the no payment condition ($N = 50$: 24 men, 26 women), participants received no payment for participating in the study nor did they receive any payment from decisions made in the BART. Participants did, however, receive course credit for their participation. In the session payment condition ($N = 117$: 43 men, 74 women), participants received \$30 for participating in the study and received payouts from decisions made in the BART. This condition best represents the most common compensation structure for decision-making studies involving clinical populations (and is thus more ecologically valid). In the decision payment condition ($N = 115$: 58 men, 57 women), participants only received payments from decisions made in the BART. Participants in the decision payment condition were also included in Mishra and Lalumière (2010).

The three conditions in this study were derived from three separate studies, and as such, the present investigation represents a small meta-analysis. We note that all three conditions were run under very similar conditions: All participants were run in the same lab using a standardized computer-based data collection procedure for individual differences in personality and behavioral measures of risk-taking. All conditions also used the same group of participants (undergraduate students at a small Western Canadian university).

2.2. The Balloon Analogue Risk Task

Participants saw a computer screen with a deflated balloon and a "PUMP" button. Each pump of the balloon increased participants' earnings by one cent, and increased the degree to which the balloon was inflated. The balloon was set to pop randomly, with 65 pumps required on average before popping. If the balloon popped, participants lost all money gained for that trial. Participants could end a trial at any time by clicking on a "COLLECT" button. Thirty trials were presented. The average number of pumps for all trials where the balloon did not pop was computed (as in Lejuez et al., 2002), as was the total number of popped balloons in the BART trials. Depending on condition, participants received their earnings from the BART following completion of the task.

2.3. Risky personality measures

2.3.1. Zuckerman's Sensation-Seeking Scale (SSS-V)

The SSS-V consists of 40 choices between paired statements regarding preferences for varied, stimulating experiences and disinhibited behavior (e.g., "A sensible person avoids activities that are dangerous" versus "I sometimes like to do things that are a little frightening"; Zuckerman, 1994). A total score was obtained by summing the number of high sensation-seeking choices.

2.3.2. Eysenck's Impulsivity Scale (EIS)

The EIS (Eysenck, Pearson, Easting, & Allsopp, 1985) consists of 19 yes/no statements about impulsive behaviors (e.g., "Do you often buy things on impulse?"). A total score was obtained by summing the number of "yes" answers.

3. Results

3.1. Replication of previous findings

A large body of research has shown that compared to women, men engage in greater risk-taking and possess higher levels of risky personality. In our sample, men showed greater risk-taking than women on the BART, although this finding was marginally non-significant, $t(280) = 1.79$, $p = .075$ (men: $M = 39.24$, $SD = 17.03$; women: $M = 35.84$, $SD = 14.88$). Furthermore, we found that compared to women, men reported significantly higher levels of impulsivity, $t(280) = 1.98$, $p = .048$ (men: $M = 7.80$, $SD = 4.15$; women: $M = 6.81$, $SD = 4.20$), and sensation-seeking, $t(280) = 5.97$, $p < .001$ (men: $M = 23.04$, $SD = 6.23$; women: $M = 18.76$, $SD = 5.76$), consistent with previous findings. Finally, we found that risk-taking in the BART was significantly correlated with sensation-seeking, $r = .16$, $p = .008$, but not with impulsivity, $r = .047$, $p = .43$. This pattern of correlations has been found in other non-clinical samples (reviewed in Lauriola et al., 2014).

3.2. Compensation and risk-taking in the BART

Across the three conditions, participants did not significantly differ on impulsivity or sensation seeking (both F s $< .46$, $ps > .63$).

However, participants significantly differed in age by condition, $F(2, 279) = 10.86, p < .001$ (session payment: $M = 21.68, SD = 3.25$; decision payment: $M = 19.98, SD = 2.04$; no payment: $M = 20.70, SD = 3.09$). Consequently, age is included as a covariate in subsequent analyses.¹

A gender (male, female) by payment condition (session, decision, none) analysis of covariance (ANCOVA) was conducted on the adjusted average number of pumps in the BART. Covariates were age, impulsivity, and sensation-seeking. There was a significant main effect of payment condition, $F(2, 273) = 13.62, p < .001$ (session payment: $M = 43.40, SD = 15.72$; decision payment: $M = 32.99, SD = 15.04$; no payment: $M = 33.22, SD = 13.92$). Follow-up contrasts indicated that participants in the session condition engaged in significantly greater risk-taking in the BART compared to those in the session and no payment conditions (both $ps < .001$). No significant main effect for gender was observed, $F(1, 273) = 1.39, p = .24$. The gender by payment condition interaction was also not significant, $F(2, 273) = 0.58, p = .56$. The age, impulsivity, and sensation-seeking covariates were not significant (all $Fs < 2.33, ps > .13$).

4. Discussion

This study provides evidence that different compensation methods influence risk-taking in the Balloon Analogue Risk Task (BART). Participants who were paid on an experimental session basis engaged in significantly more risk-taking compared to those who were paid only based on their decisions in the BART and those who were not paid at all. The BART is one of the most widely used behavioral measures of risk-taking in both clinical and experimental settings. Consequently, these results have important implications for measuring and comparing risk-taking in studies using different compensation methods.

These results are particularly important for investigators who work with non-student participant groups. Students typically gain only course credit for participation in experimental studies. If they are paid, they are typically paid based on actual decisions made and not on a per-session basis. Community and clinical samples, however, are often given a single session payment for completing a number of research tasks, typically in conjunction with additional payment based on decisions made in these tasks (circumstances identical to those in our session-payment condition). This study suggests that there may be systematic differences in decision-making in the BART based on the population examined as a byproduct of differences in compensation methods.

We predicted that participants who were not paid for participation would engage in relatively higher risk-taking, given that they would have little to gain from suppressing risk-taking. Contrary to our predictions, we found that participants who were not at all paid for their participation engaged in relatively lower levels of risk-taking. One possible explanation for this result is boredom: Participants who pumped fewer times per balloon would have finished the BART more quickly. An alternative explanation involves cognitive dissonance. When faced with two conflicting pieces of information, people often change their view of a situation so that the uncomfortable feeling of dissonance due to conflict is reduced (Festinger, 1957). Participants who were not paid may have more honestly engaged with the BART because honest decision-making provided internal justification for engagement in a relatively non-stimulating task (as has been shown using the “induced compliance” paradigm; e.g., Festinger & Carlsmith, 1959; Rhodewalt & Comer, 1979).

¹ The significant pattern of results observed for risk-taking in the BART by condition was the same regardless of whether age and individual differences in risky personality were included as covariates.

Despite the results of this study, a few limitations must be noted. Given the importance of the BART to understanding risk-taking in clinical populations, it is important to determine whether our results replicate in a broader sample beyond undergraduate students. The relative homogeneity of our sample may also explain the lack of an observed gender difference in risk-taking in the BART. A broader, more representative community sample would be more likely to show such gender differences.

We examined the two personality traits most commonly associated with behavior in the BART: impulsivity and sensation-seeking. However, other personality traits may also have an influence on behavioral risk-taking (e.g., Mishra & Lalumière, 2011). Low self-control has been associated with risk-taking and antisocial behavior in a number of domains (e.g., Tagney, Baumeister, & Boone, 2004; Wood, Pfefferbaum, & Arnekley, 1993; Raffaelli & Crockett, 2003). The Big Five personality traits have also been implicated in risk-taking: Risk-takers tend to be high in extraversion and openness to experience, and low in neuroticism, agreeableness, and conscientiousness (Nicholson, Soane, Fenton-O’Creevy & Willman, 2005).

The BART represents just one form of behavioral risk-taking. It would be interesting to examine whether different compensation methods have similar influence in other risk-taking tasks. This is particularly important given that other studies have shown that different compensation methods do not have a significant influence on risk-taking behavior in other tasks (e.g., Kühberger, Schulte-Mecklenbeck, & Perner, 2002). In particular, compensation methods may differentially influence various types of risk-taking, including framing effects (e.g., Kühberger et al., 2002), preference for high-variance outcomes (e.g., Mishra & Lalumière, 2011), or future discounting – the preference of smaller, immediate rewards to larger, distal rewards (Frederick, Loewenstein, & O’Donoghue, 2002).

We used a relatively large session payment in this study (\$30). Studies involving community or clinical populations often use payments of similar size. This relatively large payment may have reduced participants’ motivation to gain additional rewards because the potential earnings from the BART were not very large by comparison. Participants may have engaged in lower risk-taking in the session payment condition if earnings per pump were larger, as has been shown in other studies (Lejuez et al., 2007).

Together, the results of this study provide evidence suggesting that different compensation methods affect laboratory behavioral risk-taking as measured in the BART. These results also have some implications for understanding risk-taking in the real world. In many circumstances, people are rewarded for risk in a manner that is not directly tied to their decisions. That is, people can engage in risk-taking without decision-based consequences. For example, investment bankers often make risky decisions with outcomes that are not necessarily directly tied to their own salaries or bonuses. Such situations are analogous to the session-payment condition in the present study, where participants received their money regardless of their own decisions. Further research is necessary to examine the generality of payment-based influences on risk-taking in both laboratory tasks and in real-world settings.

References

- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, *125*, 367–383.
- Crowley, T. J., Raymond, K. M., Mikulich-Gilbertson, S. K., Thompson, L. L., & Lejuez, C. W. (2006). A risk-taking “set” in a novel task among adolescents with serious conduct and substance problems. *Journal of the American Academy of Child & Adolescent Psychiatry*, *45*, 175–183.
- Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences*, *6*, 613–619.

- Fernie, G., Cole, J. C., Goudie, A. J., & Field, M. (2010). Risk-taking but not response inhibition or delay discounting predict alcohol consumption in social drinkers. *Drug and Alcohol Dependence*, 112, 54–61.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Festinger, L., & Carlsmith, J. M. (1959). Cognitive consequences of forced compliance. *Journal of Abnormal and Social Psychology*, 58, 203–2013.
- Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, 40, 350–401.
- Fukunaga, R., Brown, J. W., & Bogg, T. (2012). Decision making in the Balloon Analogue Risk Task (BART): Anterior cingulate cortex signals loss aversion but not the infrequency of risky choices. *Cognitive, Affective, & Behavioral Neuroscience*, 12, 479–490.
- Kühberger, A., Schulte-Mecklenbeck, M., & Perner, J. (2002). Framing decisions: Hypothetical and real. *Organizational Behavior and Human Decision Processes*, 89, 1162–1175.
- Lauriola, M., Panno, A., Levin, I. P., & Lejuez, I. P. (2014). Individual differences in risky decision making: A meta-analysis of sensation seeking and impulsivity with the balloon analogue risk task. *Journal of Behavioral Decision Making*, 27, 20–36.
- Lejuez, C. W., Aklin, W., Daughters, S., Zvolensky, M., Kahler, C., & Gwadz, M. (2007). Reliability and validity of the youth version of the Balloon Analogue Risk Task (BART-Y) in the assessment of risk-taking behavior among inner-city adolescents. *Journal of Clinical Child and Adolescent Psychology*, 36, 106–111.
- Lejuez, C. W., Aklin, W. M., Jones, H. A., Richards, J. B., Strong, D. R., Kahler, C. W., et al. (2003a). The balloon analogue risk task (BART) differentiates smokers and nonsmokers. *Experimental and Clinical Psychopharmacology*, 11, 26–33.
- Lejuez, C. W., Aklin, W. M., Zvolensky, M. J., & Pedulla, C. M. (2003b). Evaluation of the Balloon Analogue Risk Task (BART) as a predictor of adolescent real-world risk-taking behaviours. *Journal of Adolescence*, 26, 475–479.
- Lejuez, C. W., Read, P. J., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., et al. (2002). Evaluation of a behavioral measure of risk taking: The balloon analogue risk task (BART). *Journal of Experimental Psychology: Applied*, 8, 75–84.
- Lejuez, C. W., Simmons, B. L., Aklin, W. M., Daughters, S. B., & Dvir, S. (2004). Risk-taking propensity and risky sexual behavior of individuals in residential substance use treatment. *Addictive Behaviors*, 29, 1643–1647.
- Mishra, S., & Lalumière, M. L. (2010). You can't always get what you want: The motivational effect of need on risk-sensitive decision-making. *Journal of Experimental Social Psychology*, 46, 605–611.
- Mishra, S., & Lalumière, M. L. (2011). Individual differences in risk-propensity: Associations between personality and behavioral measures of risk. *Personality and Individual Differences*, 50, 869–873.
- Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research*, 8, 157–176.
- Raffaelli, M., & Crockett, L. J. (2003). Sexual risk taking in adolescence: The role of self-regulation and attraction to risk. *Developmental Psychology*, 39(6), 1036–1046.
- Rhodewalt, F., & Comer, R. (1979). Induced-compliance attitude change: Once more with feeling. *Journal of Experimental Social Psychology*, 15, 35–47.
- Steinberg, L. (2007). Risk taking in adolescence: New perspectives from brain and behavioral science. *Current Directions in Psychological Science*, 16, 55–59.
- Tagney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72, 271–324.
- Wood, P. B., Pfefferbaum, B., & Arnekley, B. J. (1993). Risk-taking and self-control: Social psychological correlates of delinquency. *Journal of Crime and Justice*, 16(1), 111–130.
- Zuckerman, M. (1994). *Behavioural expressions and biosocial bases of sensation seeking*. Cambridge: Cambridge University Press.
- Zuckerman, M. (2007). *Sensation seeking and risky behavior*. Washington, DC: American Psychological Association.