

Personality and Temptation on Impulsivity and Risky Decision-Making

Christian J. Leong

University of Southern California

Author Note

This research report summarizes a semester-length student assignment in an *Experimental Research Methods* course. The report depicts a hypothetical experiment that was uniquely proposed by this author but executed with simulated data. The instructor for the course, William Breland, Ph.D, simulated the data set for pedagogical purposes without regard for any particular student's hypothesis. Therefore, the results should not be thought to characterize a true test of the theoretical relationships expressed by the author. Furthermore, the 3x2 factorial design that is found in the report is a constraint that has been imposed on the author by the instructor – the design is not necessarily one that the student would propose of her or his own volition.

Abstract

This paper looks to show a correlation between personality and impulsivity (speed at which decisions are made), based on prior research in personality differences between extroversion and introversion, and studies in risky-decision making and gambling. The subjects are of college age from the University of Southern California. The experiment is a 3x2 quasi experimental factorial design and will prescreen participants using the general factor of personality survey, the participants will then be primed to different independent variable conditions, and then will complete a Cambridge Gambling Task to access the variables impulsivity and risky decision-making. Significant effects were found for extroverts in the moderate temptation condition on impulsivity and a main effect was found for extroverts on risky decision-making. In the future, individuals and institutions will be able to better accesses whether some are more susceptible to risky decision-making and impulsivity based on their personality.

Personality and Temptation on Impulsivity and Risky Decision-Making

Research on decision-making has primarily focused on the physical structures of the brain and pathology. Instead of studying physical areas of the brain involved in decision-making, this paper will consider intangible traits involved in the decision-making process, such as personality (extroversion/introversion) and the effect that temptation has on impulsive decision-making based on the two personality types.

Historical evidence for these intangible traits were shown during Antoine Bechara's landmark study, which utilized the Iowa Gambling Task (Bechara, Damasio, Damasio, & Anderson 1994). Following the study, Antoine Bechara and Antonio Damasio created the somatic marker hypothesis, which states that when faced with decisions, stimuli from the environment send "marker" signals that activate the ventromedial center of the prefrontal cortices on multiple overt and covert levels (Bechara & Damasio, 2005). On a conscious (overt) level, these markers may classify a decision as dangerous, or advantages to take, while on an unconscious (covert) level, bioregulatory processes, which manifest themselves in feeling and emotion contribute further to the decision-making process (Bechara & Damasio, 2005).

Additional evidence for the influence of covert aspects in risky decision-making was shown when a study of Kyoto University students were asked to complete a modified Cambridge Gambling Task (CGT), while remembering emotionally salient words (Mochizuki & Funahashi, 2009). During the CGT they were shown an emotionally salient word, that was either positive, negative, or neutral. After they completed the CGT, they were asked to recall the emotionally salient word. On trials where positively salient words were shown, significant differences were found in the amount that participants bet (risky decision-making), which showed a link between the intangible factors of emotion on decision making.

The study hopes to show a link between the influence of personality and temptation on impulsive, risky decision-making, which is helpful for the prevention and understanding of the rationale for why such decisions are made. Little is known about the intangible, or covert influences and their magnitudes on risky decision-making. The paper will attempt to fill the gap of knowledge by combining established methods of evaluating risky decisions, using a (Cambridge Gambling Task), while dividing participants along a covert trait (personality) and measuring the time they took to make a bet, and the bet amount. Studies such as Bechura and Damasio's have shown the use of overt areas of the brain during decision-making through FMRI. When personality (the covert variable) is studied in relation to decision-making, there is the possibility of increasing evidence of several disconnected modules (overt/covert), in the process of risky decision-making.

In the future, researchers will be able to understand and solve problems with an increasing understanding of the different personality types through the study of their decision-making patterns. Studies using FMRI machines have shown that introverts and extroverts process the neurotransmitter serotonin quite differently, and as a result prefer vastly different situations for stimulation; extroverts prefer social situations, while introverts prefer quiet situations (Xu Lei, Tianliang Yang, & Taoyu Wu, 2015). Combining this understanding of the decision-making process on a neural level and the actual decisions that extroverts/introverts make will better help understanding the different personalities. Furthermore, awareness of these differences can help lead to real-world solutions that will enable individuals of each personality type to excel by removing obstacles that they would otherwise be predisposed to. The application for this study has clear roots in gambling, and addiction, and but can situationally be applied to organizational management and finance.

The study will measure the effect of temptation and personality on impulsivity and risky decision-making. The participants from the independent quasi-variable: introversion and extroversion will be tested along three levels of the manipulated variable, temptation. Initially, participants will be primed before they complete the CGT. Additionally, the experiment will be conducted in a lab decorated to look like a casino to ensure mundane realism.

In priming for the high manipulation condition of temptation, a researcher dressed as a casino-goer will win the mega jackpot worth 50 million dollars. Just as the participant walks into the casino the researcher's machine will light up, audibly congratulate him for winning, and 5 casino dancers will dance around him. In the medium manipulation of the variable temptation, the researcher will win a jackpot worth 500 dollars and his machine will light up and audibly congratulate him for winning, as the participant enters the casino. In the low manipulation of the variable temptation, the researcher will win 50 dollars and his machine will light up with no audible sound or dancers. The experiment will look to achieve experimental realism by directly attaching the money that they make or lose to what they bet during the CGT.

The dependent variables, impulsivity and risky decision-making will be operationalized based on the participant's results from the Cambridge Gambling Task. Specifically, impulsivity will be defined as the time in seconds that participants take to choose their bet. Risky decision making will be defined as the amount that the participant bets in the Cambridge Gambling Task. In the Cambridge Gambling Task, there will be an option to bet conservatively, and an option to bet aggressively, those who continuously bet aggressively will end up betting more money which is riskier than betting less money. To control for the casino being fake, and to encourage participants to bet, their winnings will be added to the total that they receive for participating in the study. The money that they lose will be deducted from the amount they got from

participating in the study. There will be a control group who only partakes in the Cambridge Gambling Task rather than being primed by the researcher upon entry to further isolate the effect of temptation on impulsive risky decision-making based on personality.

Several confounds that can affect the experiment might be income level, mental disorders, and pre-existing addictive behavior. Income level can confound the data because participants who make less income might not be as inclined to bet and can potentially bet conservatively to ensure they money they make from the study. Participants from higher income brackets might be more willing to bet because they might not be as concerned with losing money. To control for this aspect, participants will be prescreened and outliers from the lowest and highest income brackets will be excluded from the study. To participate in the study, participants will need to be in reasonable mental health and will be surveyed for pre-existing conditions. Pathologies in mental health can affect the amount of risk a participant is willing to take and the quickness with which a participant might bet. Finally, existing addictive behavior will be screened for to make sure that participants will bet as close to their natural tendencies as possible. This will be controlled by reviewing participants' past history with addiction, and screening addictive behavior before the study.

The hypothesis of this experiment is that temptation will increase impulsivity and risky decision-making in extroverts but not introverts. Since extroverts gain energy from social stimuli (Xu et al., 2015), seeing the researcher win different amounts of money at each level of manipulation will predispose extroverts to gamble more based on the positive and tempting energy. In relation to the study mentioned earlier where Kyoto University students bet more when they remembered a positive word (Mochizuki & Funahashi, 2009), extroverts will bet more when they experience the researcher (high temptation condition) win money. Conversely,

since introverts lose energy from social stimuli, the social aspect of the researcher winning money will have little effect and they will not predispose them to betting more. With increasing temptation, both extroverts and introverts are predicted to make increasingly impulsive decisions as temptation increases.

Method

The experiment will start by screening participants and then randomly assigning them to groups. Participants will be screened for income level, current mental health, and pre-existing or history of addiction. For income level, participants will be ordered from highest to lowest income brackets, and those from the highest and lowest will be excluded from the study. Participants will then be screened for mental health and problems of addiction. Only healthy and non-addictive participants will be used for the study. Following these measures, the participants will be screened for their personality type using the General Factor of Personality survey to categorize them as either an extrovert or introvert. From there, they will be randomized into different levels of the manipulated variable temptation. The participants will then complete the Cambridge Gambling Task after being primed by the researcher based on the level of the manipulated variable. If the participant is from the high temptation level, the researcher will have won 50 million dollars as the participant walks in, 500 dollars if the participant is from the medium condition, and 50 dollars if the participant is from the low condition. Finally, after the experiment, the participant will take a manipulation check to verify that the experiment's manipulation was meaningful.

Participants

The study will make use of a convenience sample of college-age, young adults from both genders from the University of Southern California. The sample will be taken because the age is

usually when impulsive risky decision-making is highest. The experiment will be designed as a 3x2 factorial with a control condition, and 350 participants will be recruited for the study. They will be prescreened for income, mental health condition, and pre-existing addictive behaviors. Upon completing the surveys, they will either continue in the study, or be considered unfit for the study and will be excluded. They will then be categorized by personality as either an extrovert or introvert using the survey of General Factor of Personality (GFPQ). Based on their personality types, the participants will then be randomly assigned to different levels of the manipulated variable (temptation level) by using a random number generator for each of the 3 levels. The number of participants in each group will not be the same, because the number of extroverts versus introverts will follow the natural occurring rate at the University of Southern California and some participants will be deemed unfit for the study. The sample is aligned with the research question that personality and temptation influence impulsivity and decision-making, because college age adults are first starting to live on their own, and do not need to deal with external pressures from parents to behave a certain way, allowing them to make risky decisions, and control their personality freely.

Instruments

During the experiment, several specific instruments will be used at different stages of the process to accurately measure variables. To categorize participants as either extroverted or introverted, the General Factor of Personality survey will be used, which has two scales, the Extraversion Scale (ES) and the Introversion Scale (IS). The survey shows internal and construct validity as it pertains to psychopathology (Amigó, Caselles, & Micó, 2010). The next instrument to be used is the computer for the Cambridge Gambling Task. To increase the mundane realism, the computer will be a 17-inch screen embedded into a slots machine where the participant will

be seated and will make use of a touch screen where the participant will tap on the bet they want to make. There will be no modifications to the Cambridge Gambling Task, such as lights or sounds that will deviate from the original and may bias the participant to make a different bet amount. The Cambridge Gambling Task does not have a test coefficient, but it instead measures the amount of money that is bet by taking either a conservative or risky decision during each trial. The total number bet will determine how risky a participant's decisions were during the task. Finally, a manipulation check will be created for this experiment. Half of the users will take the survey to provide researchers with data to measure the construct validity and allow researchers to adjust the survey for construct validity. The other half will then take this survey and provide data on whether the manipulation was meaningful. Participants from each IV level will be selected randomly.

Procedures

Participants will be initially screened to make sure that they are fit to participate in the experiment along the traits of income, mental health conditions, and history of addiction. Participants from the median percentiles of wealth will be taken to eliminate gambling habits based on income. Participants who have mental health conditions, and/or have a history of addiction will be excluded from the study. After this the participants will be categorized by personality, either an introvert or extrovert, depending on their test coefficient from their General Factor of Personality survey. Once they are screened, the participants will be randomly assigned to different levels of the manipulated variable, temptation using a random number generator with three numbers, each of which represents one of the three test conditions.

Following the random assignment of participants into groups, the experiment participants will be primed and then take the Cambridge Gambling Task. The priming mechanism will

emulate the three levels of temptation. For the condition with high temptation, a researcher dressed as a casino-goer will with the mega jackpot for 50 million dollars, his machine's lights will flash, there will be an audible congratulation from the machine, and casino dancers will dance around him, as the participant enters the casino and is instructed to walk to the machine with the Cambridge Gambling Task. For the condition with medium temptation, the researcher will win 500 dollars, his machine's lights will flash, and the machine will give an audible congratulation, as the participant walks in. In the condition with low temptation, the researcher will win 50 dollars, and only his machine's lights will flash, as the participant walks in.

Following the priming procedure, each participant will take the Cambridge Gambling Task. The corresponding dependent variables of impulsivity and risky decision-making will be measured electronically. Impulsivity will be measured by the average amount of time that a participant takes to make a bet, and risky decision-making will be measured by how much money the participant bets. During the CGT, there will be a conservative and a riskier bet, and risky decision-making will be evaluated on how much money the participant bets in total. Those numbers will then be averaged out across conditions.

After the experiment, half of the participants will immediately take a manipulation check to provide data on construct validity and if any questions need to be omitted. The other half of the participants will come back into the lab and complete the updated manipulation check.

Results

The initial hypotheses were main effects for factor A (temptation) on impulsivity and risky decision-making, a main effects for factor B (personality) on impulsivity, but not risky decision-making. A 3 X 2 multivariate analysis of covariance (MANCOVA) was conducted to determine the effect of three levels of Temptation (high, medium, low) and personality

(extroverted vs. introverted) on two dependent variables, impulsivity and risky decision-making. Significant differences were found among temptation levels on the two dependent measures, Wilks $\lambda = .856$, $F(4,580)=11.69$, $p<.001$. Significant differences were also found for the interaction of temptation with personality on both dependent measures, Wilks $\lambda = .872$, $F(4,580)=10.29$, $p<.001$. Table 1 presents the means and standard deviations of the dependent variables for the six, temptation-level by personality, groups.

Analyses of covariance (ANCOVA) for each dependent variable were conducted as follow-up tests to the MANCOVA and specific group comparisons were executed using the Bonferroni method for adjusting alpha to control for Type I errors in multiple comparisons. The ANCOVA regarding temptation level effects on impulsivity was significant, $F(2,291)=4.20$, $p=.016$. The ANCOVA regarding temptation level effects on risky decision-making was significant, $F(2,291)=19.71$, $p<.001$. The ANCOVA regarding personality effects on impulsivity and risky decision-making were both found to be insignificant. The ANCOVA regarding the temptation by personality interaction effects on impulsivity was significant, $F(2,291)=8.07$, $p<.001$. And finally, the ANCOVA regarding the temptation by personality interaction effects on risky decision-making was significant, $F(2,291)=12.71$, $p<.001$. There were no significant main effects of personality in evidence with regard to either impulsivity or risky-decision-making ($p > .05$).

Post hoc analyses to determine the effects of the interaction were conducted by examining the Bonferroni adjusted confidence intervals. Table 2 and 3 present the different groups with the obtained 95% confidence intervals around their means.

According to table 4 with respect to impulsivity: Whereas there were no significant differences in impulsivity scores exhibited by introverts whether taking part in high, moderate, or low amounts of temptation, extroverts had significantly higher levels of impulsivity (quicker bet

times) when experiencing moderate amounts of temptation as compared to when experiencing either high or low amounts of temptation (95% CI from $-.039$ to $.486$ for moderate temptation vs. 95% CI from $-.726$ to $-.201$ for high temptation and 95% CI from $.093$ to $.618$ for low temptation). There was a curious non-significant opposite trend exhibited by introverts. In contrast to extroverts, introverts seem to exhibit somewhat lower impulsivity scores under moderate amounts of temptation as compared to a more elevated sense of impulsivity when experiencing high and also low amounts of temptation. The trend was not found to be significant in this investigation but may bear further examination.

According to table 5 with respect to our second dependent variable risky decision-making, whereas there were no significant differences in risky decision-making scores exhibited by introverts taking part in the high, moderate, or low amounts of temptation conditions, extroverts had significantly higher levels of risky decision-making when experiencing each temptation condition (95% CI from $.473$ to $.973$ for high temptation and 95% CI from $-.258$ to $.242$ for medium temptation and 95% CI from $-.903$ to $-.403$ for moderate temptation). Curiously, introverts bet the most money in the medium condition, interestingly however, introverts bet more than extroverts when there was low temptation, but actually bet less than extroverts when there was high temptation.

Discussion

The results confirmed several hypothesis that were made but also disagreed with others. Firstly, there was a significant effect for temptation on impulsivity for extroverts and a significant main effect for risky decision-making for extroverts. The study however did not show significant effects for introverts on either impulsivity or risky decision-making. While not hypothesized, there were interesting interaction effects on personality and temptation on

impulsivity and personality and temptation on risky decision-making. One of the significant interactions that was found curiously showed that while introverts tended to make more (insignificant) impulsive decisions in the low and high conditions of temptation, extroverts made significantly more impulsive decisions in the medium condition. Ultimately, this paints a picture that in general, introverts are more impulsive, however, when a certain amount of stimuli is present (medium), extroverts are extremely susceptible to making more impulsive decisions. Conversely, as introverts were the least impulsive in this condition, the presence of stimuli might have caused them to be more cautious causing them to make slower decisions. In the low condition, extroverts may not be motivated to make fast decisions, because of the lack of stimuli. In the high condition, extroverts may be hesitant to make quick decisions because they might realize the additional stimuli could be influencing them to make impulsive decisions.

Another significant interaction was the interaction between personality, temptation, and risky decision-making. Interestingly, in the low temptation condition, introverts made riskier decisions, however in the medium and high conditions, extroverts ended up making risky decisions. This finding parallels prior research done on differences in personality as extroverts gain energy while being in social situations while introverts lose energy in social situations (Xu Lei, Tianliang Yang, & Taoyu Wu, 2015). As temptation increases, as the social moment of the researcher winning more money and the theatrics of the dancers, sounds, and lights increase, prior research says that the extrovert is more likely to take action than the introvert. This culminated in the finding where introverts were more likely to make riskier bets in the low temptation condition, but were not as likely to make risky bets in the medium or high temptation conditions as extroverts.

Significant effects were found for extroversion on risky decision-making in each condition of the temptation variable. As hypothesized, as the temptation increased, extroverts bet more money with each increase in temptation which agree with the previous literature that extroverts are more likely to find social situations engaging.

In general, the mixed findings of this study show that there is much more to be understood about the motivations into the personality of introverts. While the group acted according to prediction for risky decision-making, there is not a clear explanation of why the group made increasingly impulsive bets for the low and high conditions of temptation, but not for the medium condition. Conversely, for extroverts the increase in impulsivity from the low to medium condition is predictable, because of the personality type's propensity to act in social situations. The high condition was questionable how extroverts made less impulsive decisions,, but can be explained by them feeling too much stimuli, and becoming more cautious.

According to the findings, insight can be understood in that introverts are generally at a far higher risk to make impulsive decisions if there is temptation and make risky decisions if there is low temptation. However, generally extroverts are more likely to make a risky-decision as temptation increases. Finally, this information is helpful because it shows that differences in personality can to some extent predict risk in decision-making. By understanding personality, this study will better help individuals and institutions know if certain individuals are more susceptible to impulsivity and risky decision-making in a multitude of areas such as addiction, gambling, and finance.

References

- Amigó, S., Casellas, A., & Micó, J. (2010). General Factor of Personality Questionnaire (GFPQ): Only one factor to understand personality? *The Spanish Journal of Psychology*, *13*(1), may, 5-17. Retrieved April 12, 2019.
- Bechara, A., Damasio, A. R., Damasio, H., & Anderson S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*(1-3), 7-15.
- Bechara, A., & Damasio, A. R. (2005). The somatic marker hypothesis: A neural theory of economic decision. *Science Direct*, *52*(2), august, 336-372.
- Lei, X., Yang, T., & Wu, T. (2015). Functional neuroimaging of extraversion introversion. *Neuroscience Bull*, *31*(6), dec, 663-675. Retrieved April 12, 2019.
- Mochizuki, K., & Funahashi, S. (2009). Effect of Emotional Distractors on Cognitive Decision-Making in Cambridge Gambling Task. *Psychologia*, *52*, 122-136. Retrieved April 12, 2019.

Table 1.

Summary statistics of the Multivariate Analysis of Covariance (MANCOVA) and Analysis of Covariance (ANCOVA) for Temptation and Personality on Impulsivity and Risky Decision-Making

Variable	MANCOVA				ANCOVA			
	Wilks λ	F	df	p	MSe	F	df	p
Multivariate								
Temptation	.856	11.69	4, 580	<.001				
Personality	.997	.376	2, 290	.687				
Tem x Per	.872	10.285	4, 580	<.001				
Impulsivity								
Temptation					.889	4.20	2, 291	.016
Personality						.50	1, 291	.479
Tem x Per						8.074	2, 291	<.001
Risky Decision Making								
Temptation					.807	19.710	2, 291	<.001
Personality						.155	1, 291	.694
Tem x Per						12.707	2,291	<.001

Table 2.

Summary means and standard deviations for Impulsivity across Temptation and Personality conditions.

Per vs. Tem Totals	Per at Tem		Means	Standard Deviations
	Totals			
Extroversion Total			-.039	1.150
Introversion Total			.039	.825
Tem-High Total			.001	.869
	Extroversion		.224	.692
	Introversion		-.221	.972
Tem-Medium Total			-.194	1.017
	Extroversion		-.463	1.209
	Introversion		.075	.693
Tem-Low Total			.193	1.075
	Extroversion		.356	1.299
	Introversion		.029	.769

Table 3.

Summary means and standard deviations for Risky Decision-Making across Temptation and Personality conditions.

Per vs. Tem Totals	Per at Tem		Means	Standard Deviations
	Totals			
Extroversion Total			-.020	.954
Introversion Total			.020	1.054
Tem-High Total			-.450	.943
	Extroversion		.722	.619
	Introversion		-.179	1.124
Tem-Medium Total			-.136	.905
	Extroversion		-.009	.942
	Introversion		-.263	.857
Tem-Low Total			-.314	.945
	Extroversion		-.654	.692
	Introversion		-.025	1.132

Table 4.

Summary of 95% confidence intervals for Impulsivity across Temptation and Personality conditions.

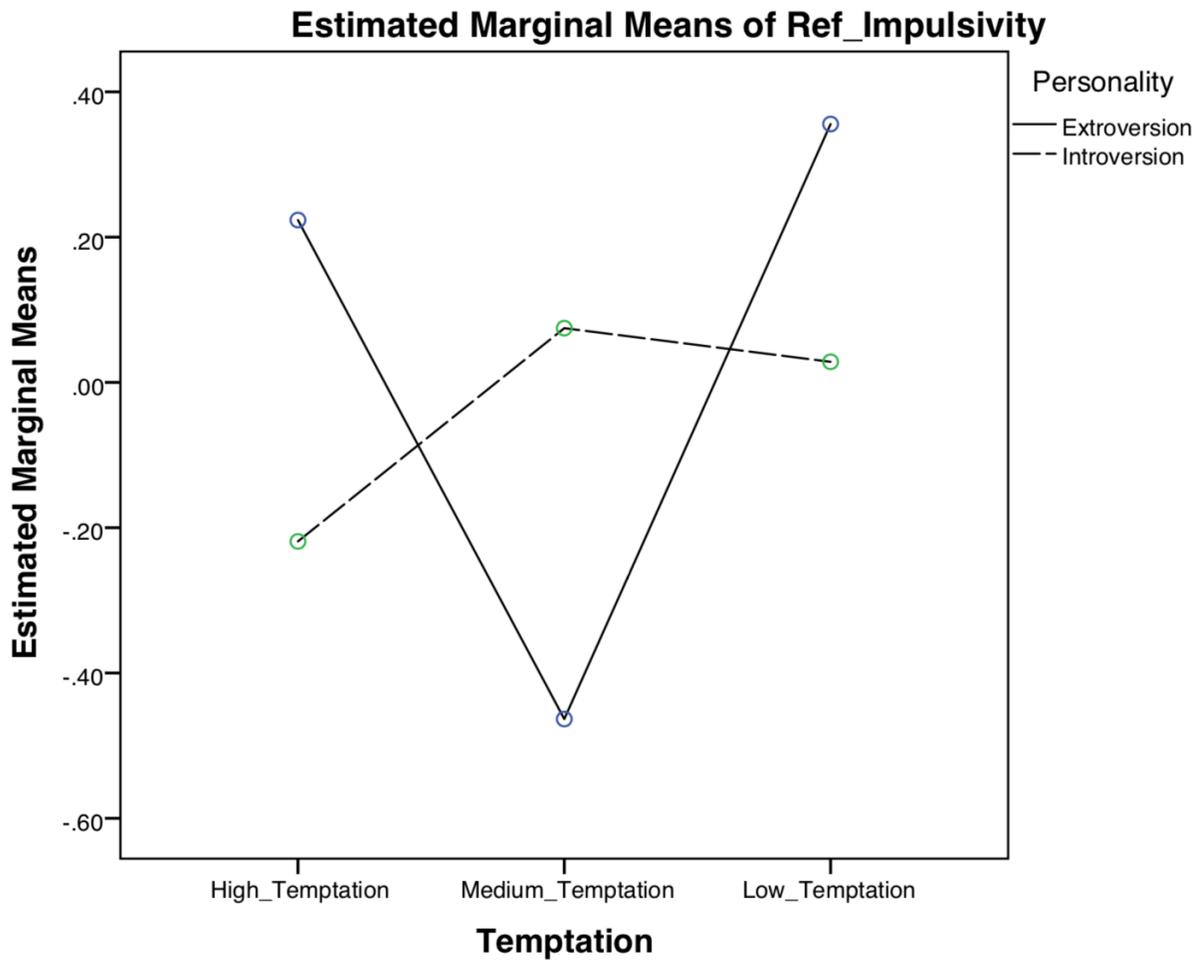
Temptation Condition	Personality Condition	Lower Bound	Upper Bound
Tem-High	Extroversion	-.039	.486
	Introversion	-.481	.044
Tem-Medium	Extroversion	-.726	-.201
	Introversion	-.188	.337
Tem-Low	Extroversion	.093	.618
	Introversion	-.234	.291

Table 5.

Summary of 95% confidence intervals for Risky Decision-Making across Temptation and Personality conditions.

Temptation Condition	Personality Condition	Lower Bound	Upper Bound
Tem-High	Extroversion	.473	.973
	Introversion	-.075	.425
Tem-Medium	Extroversion	-.258	.242
	Introversion	-.512	-.012
Tem-Low	Extroversion	-.903	-.403
	Introversion	-.224	.276

Estimated Marginal Means of Impulsivity



Estimated Marginal Means of Risky Decision-Making

