Accounting for the Correlation between Perceived Risks and Rewards to Crime

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Perceived risks and rewards to crime are known to predict later offending and as such, are often the target of crime-reduction interventions. The negative relationship between risks and crime, as well as the positive relationship between rewards and crime, have long been established in criminology, however, individuals' confounding of risk and rewards at the time of decision-making has largely been overlooked. The correlation between risk and reward (i.e., benefit) has been succinctly explained by Slovic and colleagues (2004: 315) who stated, "whereas risk and benefit tend to be positively corelated in the world, they are negatively correlated in people's minds (and judgements)." In regard to crime, it is typically the case than higher rewards are related to higher risks (e.g., a bank robbery), but the aforementioned logic would lead us to believe that potential offenders may associate higher levels of reward with *lower* levels of risk. Similarly, potential offenders may associate lower levels of risk with *higher* levels of reward. If it is the case that individuals' perceptions of these attributes of risk or reward are impacted by perceptions of the other, then this has important implications for policy solutions to crime.

This hypothesis can best be explained by the affect heuristic. The origin of the affect heuristic begins from the finding that, despite the general pattern of a positive correlation between risk and benefit, individuals perceive negative correlations (Fischhoff et al., 1978). As scholars began to delve into this finding, several reached the conclusion that this association is due to the *feeling* or *affect* attached to the topic (Alhakami & Slovic, 1994; Finucane et al., 2000), a phenomenon that has since been referred to as the affect heuristic (Slovic et al., 2004). The implication of the affect heuristic is described by Slovic and colleagues (2004: 315); "If a general affective view guides perceptions of risk and benefit, providing information about benefit should change perception of risk and *vice versa*" (emphasis in original). This has been shown empirically by Finucane and colleagues (2000) who set out to examine whether individuals' perceptions of the risk and rewards of technology were altered by manipulating either risk (high/low) or rewards (high/low). The manipulations of risk were designed to alter affect by describing the severe risks

of each technology (high risk) or by describing the lack of risks and safety protocols surrounding each

technology (low risk). The manipulations of rewards alternatively described how beneficial the technology

would be for society (high reward) or discussed the very limited benefits of the technology (low reward).

The results of this study suggest that affect is the mediator which explains the relationship between

the impact of reward (risk) on perceptions of risk (reward) (Finucane et al., 2000; Slovic et al., 2004). In

other words, being presented with information on the rewards of a new technology results in positive

changes to one's affect, subsequently resulting in decreased perceptions of risk. If it is possible that

parallels can be drawn to crime, where perceptions of rewards to crime impact perceptions of risk and vice

versa, then this is an important implication for our understanding of offender decision-making.

Notably, recent criminological research has called for attention to behavioral economics,

particularly cognitive heuristics and biases such as the affect heuristic, when examining crime and

developing policy solutions to crime (Loughran, 2019; Pickett & Roche, 2016). Some have begun to

theorize about the possibility that offenders downplay risks when rewards are high (Clark, 2013), however,

few studies have tested this hypothesis or related hypotheses regarding cognitive biases in criminal

decision-making (e.g., Pickett, 2018; Pogarsky & Loughran, 2016; Pogarsky, Roche & Pickett, 2018). The

most applicable test of the relationship between reward and risk was conducted by Pogarsky and

colleagues (2017) who examined how affect impacts perceived risks of being caught and the perceived

benefits of texting while driving. In this study, affect was altered by presenting information on deaths from

texting and driving (negative), information on the prevalence of texting (neutral), and the benefits from

texting (positive). This study yielded results consistent with the affect heuristic for risk (i.e., risk was lowest

in the positive group and highest in the negative group), but this pattern was not found for reward

(Pogarksy, Roche & Pickett, 2017). A related study was conducted by Kamerdze and colleagues (2014)

who examined the effect of recalling a negative, positive or neutral experience on intentions to drink and

drive, or to cheat on an exam. Positive and negative affect were not found to be significantly related to

decisions to offend; only when *intense* positive affect was examined by coding only those with the highest

affect scores did positive affect negatively predict intentions to offend. Interestingly, perceptions of one's

risk of getting caught were not significant mediators of this relationship, contrary to expectations.

These two studies raise questions regarding why larger effects were not found in support of the

affect heuristic, contrary to the findings from research in related fields. One possibility is that research

from these other fields manipulated affect by altering the rewards or risks surrounding the *exact* situation,

rather than providing information on related risks or rewards to manipulate affect. In other words, as

opposed to manipulating affect by explicitly providing information surrounding the rewards or risks of

crime as is done in the decision-making literature (see Slovic et al., 2004), the existing criminological

research has focused on manipulating affect *without explicitly mentioning the risk or reward for that behavior*. For

example, rather than presenting information on how many individuals are caught texting and driving (risks

of *apprehension*), Pogarksy and colleagues (2017) presented information on the risk of death from texting

and driving. Similarly, rather than including information on the benefits of texting while driving explicitly,

affect was manipulated by presenting information on the benefits to texting in general.

It is unfortunate that the few studies which have examined affect and its role on criminal decision-

making have not framed the research as a test of the direct correlation between risk and reward. These

studies on offender decision-making offer some insight into the affect heuristic, but they do not aid in our

understanding of whether the rewards (risks) of a criminal opportunity impact perceptions of the risks

(rewards) of that opportunity through affect.

If it is the case that rewards to crime directly impact one's perceptions of risk, then the existing

research on the role of risk and reward in offender decision-making may have masked the importance of

risk, as well as the importance of the interplay between risk and reward. Though relatively fewer studies of

offender decision-making have focused on the effect of rewards to crime relative to the risks (Loughran,

2019), the existing studies have generally concluded that rewards to crime are equally as important as

perceived risks, or in some cases, are more important. As stated, these studies may be underestimating the

effect of risk by ignoring the negative correlation between rewards and risks that occurs *before* respondents

report on their perceived levels of risk and reward. If this is the case, recommendations to move crime-reduction strategies away from a focus on risks to a sole focus on reward may be less successful than expected given this nuance in decision-making. Additionally, crime-reduction strategies designed solely to impact perceptions of risk may be misguided if not coupled with efforts to decrease rewards.

Common sense says that crimes which are riskier are likely to be the ones with larger rewards, suggesting a positive correlation. This aligns with the notion that risk and reward tend to be positively correlated in the real world (Slovic et al., 2004). Furthermore, in regard to crime, positive correlations between risk and reward should be expected given that qualitative research has demonstrated that the 'risky' aspect of crime is in fact part of the thrill (Jacobs, Topalli & Wright, 2003). Research has demonstrated that some offenders enjoy risky crime opportunities (Katz, 1988). Therefore, apprehension risk should be positively correlated with rewards to crime, particularly intrinsic rewards such as the thrill or rush one gets from engaging in crime. However, although direct tests of this relationship do not yet exist in criminology, *negative* correlations between perceived risks and rewards have been found in several studies and datasets (Pickett & Roche, 2016; McCarthy and Hagan, 2005; Piquero and Tibbetts, 1996; Shulman, Monahan, & Steinberg, 2017). Given the known generally positive correlation between risk and reward in the world, why then are risk and reward negatively correlated in criminological studies? Do these negative correlations persist when individuals decide to offend? And most importantly, do these perceptions of risk or rewards impact one's perceptions of the alternative attribute (reward or risk) for criminal decision-making? Building off of the reviewed evidence, I hypothesize the following, in line with the affect heuristic and a negative correlation between risk and reward:

H1: When monetary rewards are greater (smaller), average perceptions of risk will be smaller (greater).
H2: When social rewards are greater (smaller), average perceptions of risk will be smaller (greater).
H3: When risks are greater (smaller), average perceptions of reward will be smaller (greater).

Alternative hypotheses below describe what would be expected given rational decision-making and a positive correlation between risks and reward:

H1A: When monetary rewards are greater (smaller), average perceptions of risk will be greater (smaller).

H2A: When social rewards are greater (smaller), average perceptions of risk will be greater (smaller).
H3A: When risks are greater (smaller), average perceptions of reward will be greater (smaller).

Study Design & Design Request

The current study will employ an experimental 4x2 factorial design, resulting in 8 possible experimental units, to assess the effects of risk and reward on perceptions of reward and risk. Of the 4 possible vignettes, respondents will be presented with 2 vignettes, each with one experimental manipulation (i.e.., high or low risk or reward). Each respondent will receive one scenario which manipulates risk (either Vignette A - *Drunk Driving* or Vignette B - *Theft from a Vehicle*) and one where social or monetary reward is manipulated (either Vignette C – *Fight* or Vignette D - *Tax Fraud*). The scenarios will be randomized between respondents and counterbalanced so that half of respondents are presented with the risk scenario prior to the reward scenario and vice versa. For the exact wording of each scenario and the possible manipulations shown in brackets, see Appendix B. For a summary of the conditions, see Appendix C.

After reading each scenario, respondents will answer questions regarding their perceived *risk of apprehension*, *overall reward*, *social reward*, *monetary reward,*[1] *intrinsic reward* and *willingness to offend* given the scenario described. Questions such as these are commonly used in criminological research examining offender decision-making (see Nagin & Pogarsky, 2001; Pickett & Bushway, 2015; Pogarsky, Roche & Pickett, 2017). For a complete list of questions and specific question wording, see Appendix D. It is worth noting that in scenarios where risk is manipulated, perceptions of risk will be assessed as a manipulation check to ensure that risk varied appropriately between vignettes. Similarly, this will be done for the rewards scenarios as well to ensure the reward manipulation was successful.

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[1] Note that the question regarding monetary reward is only asked in Vignette B regarding the theft of cash from a vehicle and replaces question 3 regarding social rewards. There are no monetary rewards in the scenarios surrounding driving drunk or fighting, and the monetary reward in the tax fraud vignette is directly manipulated in the vignette itself.

Conducting this study requires 12 items to be added to the standard survey, in addition to the use of demographic items regarding age, race, gender, education, and time spent responding to each vignette.[2] This includes 2 vignettes per survey and 5 questions following each vignette. This results in a sample size of approximately 4300 for a general population sample. With this sample size, around 2150 respondents will be presented with each scenario, of which 1075 will receive each manipulation. Hypotheses will be tested by comparing the means for risk, rewards, and willingness to offend by each level of risk or reward within each vignette. Based on mean differences between groups from prior research (see Pogarsky, Roche & Pickett, 2017), this sample size is appropriate to detect significant differences across experimental conditions.[3] Power analyses based on the results of the pilot study are presented in Appendix E. Based on the average differences across conditions found in the pilot, there is ample statistical power to detect differences in the means across experimental conditions, assuming $\alpha = 0.05$.

The TESS design is appropriate for this study for several reasons. First, existing studies on perceptions of arrest risk and rewards to crime were previously based on undergraduate samples but have begun to transition to nationally representative samples using online platforms such as Amazon's Mechanical Turk ™ (Mturk) (e.g., Barnum & Solomon, 2019; Pickett, Roche & Pogarsky, 2018; Pogarsky et al., 2017). Though these larger and more representative samples are an improvement, they are still limited to MTurk users. The TESS design would allow for a nationally representative sample of adults in the United States. Furthermore, the larger study design available through the Young Investigators Competition allows for the manipulation of both risk and reward, as well as further exploration of variation in the effects of varying levels of social, monetary and intrinsic reward and allows for the possibility of detecting smaller differences in perceptions across groups. The Young Investigators

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[2] Existing research on the affect heuristic and decision-making has demonstrated that when time is limited, the negative relationship between risk and reward is increased (Finucane et al., 2000). While it is not feasible to limit the time spent on each question in the proposed study, knowledge of the time each respondent spends on the questions will provide insight into the findings.

[3] Power analyses based on estimates from prior research not shown but available upon request.

Competition allows for a more complete test of competing hypotheses derived from the affect heuristic

framework and more traditional criminological frameworks of offender decision-making.

Pilot Study

In May 2021, I conducted a pilot study on Amazon's MTurk to test these hypotheses. In total, 76,

87, 73 and 88 respondents completed Vignette A, B, C and D, respectively. For full results in tabular form,

see Table 1 for Risk Manipulations and Table 2 for Reward Manipulations in Appendix A. Shaded boxes

denote the results for manipulation checks to assess if the vignettes were successful at varying risk and

reward, and the columns to the right restrict the sample to just those respondents who passed the

instructional manipulation check (IMC).[4] In the majority of tests, manipulation checks demonstrate that

the experimental manipulations of risk and reward were operating as intended. In some instances where

small differences were found across experimental conditions or if the patterns were in the opposite

direction than anticipated, vignette conditions were updated to signal larger differences in risk or reward

across conditions.

Furthermore, the pilot allowed for the estimation of means and standard deviations for the

majority of the key measures. A power analysis based on the smallest, average, and largest mean

differences across Vignettes for each outcome was used to calculate the sample size needed to detect

statistically significant differences between experimental conditions (see Appendix E). Using a power-level

of 0.9 and alpha of 0.05, the proposed study will have a sufficient sample size to detect the average mean

differences found in the pilot for all vignettes, and the smallest mean differences found in the pilot for the

majority of outcomes. Unexpectedly small differences in mean perceptions of risk and social rewards were

detected in the restricted sample based only on those who passed the IMC (1.4% and 0.14, respectively).

In order to detect these small differences in the current study, it would require sample sizes greater than

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[4] One IMC was presented at the beginning of each Mturk survey which designated a specific answer to enter on the following page. This procedure is done to assess if respondents are paying sufficient attention to the survey and is common practice in Mturk studies (Berinsky, Margolis & Sances, 2014).

those proposed. However, differences of this small magnitude are substantively meaningless for these

outcomes of risk and social rewards, therefore, differences of this size would imply no substantively

important differences in risk or reward regardless of statistical significance.

Additionally, assuming 1000 cases, the proposed study will be sufficiently powered to detect

differences of 4% on the 0-100% scale for risk, and differences of 0.18 on the 1-5 scale for social rewards.

These differences are far smaller than the average differences detected in the pilot study. Notably for the

risk outcome, prior research on the affect heuristic in criminology has detected differences of 5% in means

across groups by affect (Pogarsky, Pickett & Roche, 2017).[5] Therefore, the proposed sample size of 4300

cases is more than sufficient to detect substantively meaningful differences in the focal outcomes between

experimental conditions.

Contribution of the Study

The current study will contribute to the knowledge base for both criminological theory and policy

solutions to crime. Currently, it is accepted that both risks and rewards to crime impact one's decision to

offend, with the more recent research suggesting that rewards play a larger role. If in fact rewards indirectly

impact risk perceptions, then this oversight is important for the conceptualization of the role of risk and

reward, and also draws into question the ways that these concepts are currently measured.

Furthermore, despite the vast evidence on the relationship between perceptions of arrest risk and

offending, little is known regarding how these perceptions of arrest risk are actually formed (Piquero,

Paternoster, Pogarsky & Loughran, 2011; Paternoster, 2010). If it appears that perceptions of risk are

impacted by perceived rewards (and vice versa), and in predictable ways, then this information is useful for

theorizing why offenders engage in certain crimes over others, or at all, as well as for designing effective

strategies to deter offenders and reduce crime. Regardless of whether my hypotheses are supported, the

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[5] Note that there is no prior research aside from the pilot study to base mean differences or standard deviations between groups for social reward.

results will aid in our understanding of the risk-reward calculus and improve our understanding of the

affect heuristic.

Importantly, the findings will be beneficial to fields outside of Criminology, including Behavioral

Economics, Risk Management, Public Policy, Sociology, and Psychology. These fields are interested in

cognitive biases in decision-making, as well as how to manipulate perceptions of risk and reward. Further

understanding the correlation between risk and reward in a criminal context will add to the evidence base

in these related fields. Overall, the current study addresses an important and overlooked research question

that gets at the heart of how risk and reward perceptions are formed, and how these perceptions translate

into offending behavior.

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Appendix A. Pilot Study Results

Table 1. Risk Manipulations (Pilot Study) - Vignettes A & B

	Full Sample		Sample who Passed IMC	
	High Risk	Low Risk	High Risk	Low Risk
Vignette A - Driving				
Risk	53.65%	45.73%	55.32%	37.52%
Overall Reward	47.79	55.42	37.60	53.30
Social Reward (Respect)	2.51	2.70	1.92	2.48
Problem	2.21	2.18	1.60	1.96
Likelihood	2.60	2.70	1.88	2.35
	N=43	N=33	N=25	N=23
Vignette B - Theft				
Risk	51.41%	51.67%	54.07%	36.00%
Overall Reward	54.00	48.79	40.21	35.79
Social Reward (Respect)	2.33	2.02	1.57	1.71
Monetary Reward (Cash)	$5,357.80	$3,401.15	$ 13,068.43	$895.42
Problem	1.97	2.04	1.50	1.71
Likelihood	2.64	2.48	1.93	2.08
	N=39	N=48	N=14	N=24

$*p<0.05, ^{t}p<0.10$

Note. Cells highlighted in gray denote manipulation checks.

Table 2. Reward Manipulations (Pilot Study) - Vignettes C & D

	Full Sample		Sample who Passed IMC	
	High Reward	Low Reward	High Reward	Low Reward
Vignette C - Fight				
Risk	64.84%	56.33%	60.26%	50.61%
Overall Reward	53.52	47.69	36.63	39.22
Social Reward (Respect)	2.94	2.74	2.84	2.91
Problem	2.55	2.50	2.47	2.52
Likelihood	2.68	2.69	2.26	2.26
	N=31	N=42	N=19	N=23
Vignette D - Tax Fraud				
Risk	46.02%	49.95%	41.93%	40.52%
Overall Reward	48.63	35.32	47.07	27.91
Social Reward (Respect)	2.35	2.37	2.34	2.09
Problem	2.04	1.84	1.93	1.61
Likelihood	2.52	2.26	2.28	1.78
	N=50	N=38	N=29	N=23

Note. $*p<0.05, ^{t}p<0.10$

Note. Cells highlighted in gray denote manipulation checks.

Appendix B. Experimental Vignettes

A. Drunk Driving (Social Reward Outcome with Apprehension Risk Manipulated)

Imagine you drove to meet up with some friends at a bar about 20 minutes from your house. You and your friends have had a great evening singing, dancing, and drinking all night. Its 2am and the bar is shutting down. You are pretty certain you are over the legal limit to drive, but you promised your friends you would drive them home. This is a new group of friends and you really want to be invited out with them again in the future. You know from talking to a colleague who is a retired police officer, that police typically are not out during the week, but instead are usually out on the weekends, though he mentioned that they are almost always out with extra patrols on holiday weekends. It is a [TUESDAY/SATURDAY OVER A HOLIDAY WEEKEND].

B. Theft from a Vehicle (Monetary Reward Outcome with Apprehension Risk Manipulated)

Suppose you are walking down the street one evening on your way to hang out with some friends. You pass a nice-looking parked car and slow down to admire it. When you do, you notice that the passenger window is rolled half of the way down and that there appears to be some cash just sitting on the front seat. [YOU HAVEN'T SEEN ANYBODY ELSE AROUND/YOU NOTICED A SECURITY CAMERA A FEW FEET BACK AND YOU CAN SEE SOME POLICE OFFICERS UP AHEAD].

C. Fight (Risk Outcome with Social Reward Manipulated)

Suppose that you and some friends are at a party at the home of two of your closest friends. The evening is going great and everyone seems to be having a good time. All of a sudden, someone you have never met before gets in your face and starts yelling and shoving you. You have no idea what he is upset about, but he is not letting up and seems to be getting more upset by the minute. You look over at your friends and they are all staring and watching to see what you will do. [YOU KNOW THAT YOUR FRIENDS WOULD BE REALLY IMPRESSED AND THINK IT WAS REALLY COOL IF YOU WERE TO FIGHT THIS GUY/YOU KNOW THAT YOUR FRIENDS, INCLUDING THOSE WHO THREW THE PARTY, WOULD BE EXTREMELY UPSET AND ANGRY AT YOU IF YOU WERE TO FIGHT THIS GUY].

D. Tax Fraud (Risk Outcome with Monetary Reward Manipulated)

It is almost April and it is time to complete your income taxes. You have a close friend who has been a tax accountant for 20 years. They mention that they can help you with your taxes and manipulate some numbers to help save you money. After they go over your taxes, they tell you that they can save you about [$250/$1250], but you will have to lie on your tax forms. This is illegal and referred to as tax fraud.

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Appendix C. Summary of Conditions

Vignette	Focal Dependent Variables	Manipulation			Condition
		Risk	*Reward*		
			Social	Monetary	
A (*Drunk Driving*)	Overall Reward, Social Reward, Intrinsic Reward, Willingness to Offend	High			(1)
		Low			(2)
B (*Theft from Vehicle*)	Overall Reward, Monetary Reward, Intrinsic Reward, Willingness to Offend	High			(3)
		Low			(4)
C (*Fight*)	Risk, Willingness to Offend		High		(5)
			Low		(6)
D (*Tax Fraud*)	Risk, Willingness to Offend			High	(7)
				Low	(8)

Appendix D. Questions following Each Vignette

1. What is the percent chance (or chances out of 100) that you would get caught by the [POLICE/ IRS] if you [DROVE HOME/TOOK THIS MONEY/FOUGHT THIS GUY/LIED ON YOUR TAXES]? Please provide a percentage from 0-100.

   _____%

2. How rewarding on a scale of 0-100, with 100 being the most rewarding, would it be if you [DROVE HOME/TOOK THIS MONEY/FOUGHT THIS GUY/LIED ON YOUR TAXES]?

   _____

3. How likely is it that you would you lose respect from your family and friends if they found out that you [DROVE HOME/FOUGHT THIS GUY/LIED ON YOUR TAXES]?

   1) Very Unlikely
   2) Unlikely
   3) Equally Likely and Unlikely
   4) Likely
   5) Extremely Likely

4. How much money do you believe you would get from the seat of the car if you TOOK THIS MONEY?[6]

   1) $1-$25
   2) $26-$99
   3) $100-$499
   4) $500-$999
   5) $1000 or more

5. How much thrill or rush would it be if you [DROVE HOME/TOOK THIS MONEY/FOUGHT THIS GUY/LIED ON YOUR TAXES]?

   (0) No fun or kick at all (1)   (2)   (3)   (4)   (5)   (6)   (7)   (8)   (9) (10) A great deal of fun or kick

6. How likely is it that you would [DRIVE HOME/TAKE THIS MONEY/FIGHT THIS GUY/LIE ON YOUR TAXES] in this scenario?

   1) Very Unlikely
   2) Unlikely
   3) Equally Likely and Unlikely
   4) Likely
   5) Extremely Likely

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[6] Note: This is only asked following Vignette B (*Theft from Vehicle*) and replaces Question 3 in that condition.

Appendix E. Power Analyses

Overall Reward
H0: μ1 = μ2
HA: μ1 ≠ μ2

Social Reward (Respect)
H0: μ1 = μ2
HA: μ1 ≠ μ2

Monetary Reward (Cash)
H0: μ1 = μ2
HA: μ1 ≠ μ2

Intrinsic Reward (Thrill)
H0: μ1 = μ2
HA: μ1 ≠ μ2

Risk (with Monetary Reward)
H0: μ1 = μ2
HA: μ1 ≠ μ2

Alpha-Level	Estimated Sample Mean	Hypothesized Sample Mean	Difference in Means	N with power-level .8	N with power-level .9
Overall Reward					
0.05	Smallest		4.40 (0-100)	848	1135
0.05	Average		8.20 (0-100)	245	327
0.05	Largest		15.70 (0-100)	67	90
Social Reward (Respect)					
0.05	Smallest		0.14 (1-5)	1154	1544
0.05	Average		0.30 (1-5)	252	337
0.05	Largest		0.56 (1-5)	73	97
Monetary Reward (Cash)					
0.05		Small	0.20 (1-5)	566	757
0.05		Medium	0.40 (1-5)	142	190
0.05		Large	0.60 (1-5)	63	85
Intrinsic Reward (Thrill)					
0.05		Small	0.35 (0-10)	751	1005
0.05		Medium	0.55 (0-10)	304	407
0.05		Large	0.75 (0-10)	164	219
Risk					
0.05	Smallest		1.40% (0-100)	6325	8467
0.05	Average		5.90% (0-100)	357	477
0.05	Largest		9.70% (0-100)	132	177

*Power analyses are based on the mean and smallest differences found in the pilot study and their accompanying standard deviations. For *intrinsic reward*, which was not tested in the pilot, I use the standard deviation from the Pathways to Desistance study which is commonly used in Criminology to similarly assess perceptions of arrest risk and rewards to crime. *Monetary reward* is asked about in the pilot study, but I have chosen to change the answer choices to categorical options ranging from 1-5 rather than a write-in option. I now assume a standard deviation equivalent to that of *social reward*, which is also measured on a 5-point scale. The above power analyses based on the results of the pilot study yield sample sizes comparable to those previously estimated based on means and standard deviations from prior research (see Pogarsky, Pickett & Roche, 2017) and existing datasets (see the Pathways to Desistance study).