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Uncertainty and heuristics in offender decision-making: Deviations from rational choice

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ABSTRACT

Purpose: Using perspectives from prospect theory and behavioral economics, we explore examples of offender decision-making that appear inconsistent with rational choice and expected utility theories.
Methods: Semi-structured interviews were conducted with 200 adult offenders with three or more convictions for predatory property or street crime (theft, burglary, and/or robbery). Subjects were asked to describe situations in which they had encountered crime prevention or control measures, and their relevant responses. Specific questions focused on how offenders assessed the effort, risk, and reward involved. Thematic analysis was employed to identify deviations from rational choice perspectives.
Results: Offenders, particularly abusers of drugs and/or alcohol, often held distorted perceptions of effort, risk, and reward. Cognitive biases and heuristics influenced logic and many offenders were guided by their intuition, even to the point of superstition. Some had dual motivations ("needs" and "wants") that resulted in a nonlinear relationship between value and utility.
Conclusions: Rational choice and expected utility theories do not adequately explain offender decision-making, particularly when drug addiction is involved. Effective crime prevention and control strategies require a more comprehensive understanding of how offenders evaluate costs and benefits, and make situational offending decisions.

1. Introduction

Crime control and prevention strategies rely on a proper understanding of offender decision-making. After all, it would be difficult to determine what measures are likely to be effective if we know little about the factors that affect criminal choices in various situations. While research on offender decision-making has been influenced, in the main, by the rational choice perspective (Cornish & Clarke, 1986), efforts have been made in recent years to apply elements from other theories and disciplines, including cognitive modeling (Bosse, Gerritsen, & Treur, 2011), cognitive psychology and emotion (Leclerc & Wortley, 2013; van Gelder, 2013; van Gelder, Elffers, Reynald, & Nagin, 2013), behavioral economics generally (Bernasco, 2010; Bernasco & Nieuwbeerta, 2005), and prospect theory specifically (Kahneman, 2003).

Here, we review qualitative data from an NIJ-funded study of offender decision-making. Subjects were asked how they responded to crime prevention and control measures they encountered in the course of offending. Semi-structured interviews were conducted with 200 adult offenders, in jail or on probation, who had at least three convictions for predatory property or street crime (theft, burglary, and/or robbery). Aspects of offender decision-making not well explained by rational choice theory were coded and grouped into six themes involving the role of intuition and other cognitive heuristics, perceptions of risk and reward, management of uncertainty and luck, and distortions of rationality from drug and/or alcohol use. These themes are examined within the context of prospect theory and related perspectives, and their implications for crime control and prevention efforts discussed.

2. Literature review

2.1. Rational choice theory and expected utility models

The rational choice perspective argues that offenders (like non-offenders) make loosely rational decisions that guide their behavior. A criminal's decision-making is assumed to be bounded insofar as it is likely to be "constrained by limits of time and ability and the availability of relevant information" (Cornish & Clarke, 1986, p. 1). Nevertheless, offenders consider, however briefly and limitedly, the costs and benefits

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of individual choices. As such, it has been argued that decision-making in relation to criminal behavior should be susceptible to incentives and deterrents. When the perceived costs of a particular action are believed to outweigh the potential benefits, offending is seen to be more difficult and/or less attractive, thus making crime less likely. According to the rational choice perspective, crime can be reduced by removing opportunities, intensifying the necessary effort, increasing apprehension risks, and/or reducing the anticipated rewards. These are the underlying principles of situational crime prevention (Clarke, 1992, 1995).

The rational choice perspective is based on Becker's (1968) adoption of the von Neumann-Morgenstern expected utility paradigm, which aims to approximate decision-making behavior in risky situations (Schoemaker, 1982; von Neumann & Morgenstern, 1944). The utility of a course of action is calculated based on the sum of each possible "payout" (i.e., benefit minus cost) multiplied by its probability of occurrence. The decision to offend in a given situation, however, differs in important respects from economic choices. The latter focus on the potential gain or loss of money. While property crime rewards are typically also money or goods, the costs include both effort and risk of punishment.[1]

Some researchers, however, have claimed that expected utility theory is inadequate for explaining all criminal decision-making. Lattimore and Witte (1986) argue such models are not applicable to offenders who rarely face simple, dichotomous choices as to whether or not to commit a particular crime. Instead, they are more likely to encounter complex arrays of alternatives in relation to where and when to offend, a range of possible targets, and so on, which expected utility models cannot easily accommodate. Furthermore, a series of recent experiments has shown the decisions made by criminals are often intuitive and, as such, subject to heuristic effects and biases (Pogarsky, Roche, & Pickett, 2017).

2.2. Prospect theory and behavioral economics

Bounded rationality recognizes the discrepancy between complete rationality and human cognition as it functions in the real world on actual problems with practical limitations. While crime choices are influenced by effort, risk, and reward, offenders often have difficulty integrating multiple information streams into a single judgment (Carroll & Weaver, 1986). Consequently, they tend to simplify decision-making and follow suboptimal cognitive shortcuts that erode rationality.

Lattimore and Witte (1986) review a number of criminological studies in which the empirical findings are inconsistent with expected utility theory, and propose an alternative explanatory framework based on prospect theory. Prospect theory and other insights from behavioral economics seek to interpret certain exceptions and anomalies observed in human decision-making where everyday judgments do not adhere to the laws of probability (Kahneman & Tversky, 1979). These observations suggest the underlying cognitive processes may be different from those implied by rational choice models (Kahneman & Tversky, 1972). Cognitive psychologists and behavioral economists have attempted to explain asymmetry in human choices between probabilistic alternatives involving risk and the evaluation of losses and gains (Kahneman, Slovic, & Tversky, 1982). "Prospect theory is a theory of decision-making under conditions of risk. Decisions are based on judgments … assessments about the external state of the world. They are made especially challenging under conditions of uncertainty, where it is difficult to foresee the consequences of outcomes of events with clarity" (McDermott, 2001, p. 15).

Humans exhibit limited rationality in the face of life's complexities and uncertainties. One of the main premises of prospect theory is the relevance of heuristics—rules of thumb that substitute simple questions for more complex ones (Gilovich, Griffin, & Kahneman, 2002). Judgmental heuristics, commonly used to estimate probabilities and values, operate at an intuitive level. Humans employ both intuitive and rational decision-making, also known respectively as System 1 and System 2 processes (Kahneman, 2003, 2011). Some criminologists have used similar dual-process models to explore the interaction of emotion and cognition in offender decision-making[2] (van Gelder, 2013; van Gelder & de Vries, 2014).

Heuristics are cognitively "cheap" and arguably rational because they usually work well in natural environments (Todd & Gigerenzer, 2000). However, some heuristics, known as cognitive biases, systematically lead to error (Myers, 2002). Their use can inadvertently result in non-rational decision-making because most cognitive functioning, including perception, information processing, and memory, occur outside of conscious awareness (Heuer Jr., 1999). Examples of cognitive biases include anchoring (overreliance on initial information), availability (influence of prior examples that readily come to mind), representativeness (classifying items or events in terms of their similarity to typical cases), and framing (interpretation influences caused by presentation and context) (Tversky & Kahneman, 1973, 1981). Time pressures can increase biasing effects, perhaps because information selectivity is higher and decision criteria thresholds lower (Dror, Busemeyer, & Basola, 1999).

Prospect theory perspectives have value for understanding anomalies in offender decision-making that are inconsistent with rational choice theory. The use of heuristics, biases, framing, and other cognitive strategies help explain offender choices that appear irrational in terms of expected utility approaches. Aside from any deviations from rationality due to drug use or impulsive personalities, offender decision-making is also susceptible to the same biases found in the general population. These are better accommodated within a prospect theory dual-process framework, more specifically within the workings of System 1, and research on offender decision-making has begun to explore the potential utility of these ideas (Loughran, Paternoster, Piquero, & Pogarsky, 2011; Loughran, Pogarsky, Piquero, & Paternoster, 2012; Pickett, 2018; Pogarsky & Piquero, 2003; van Gelder & de Vries, 2014).

The differences between prospect theory and expected utility theory have potential implications for rational choice theory as applied in criminology (Pogarsky, Roche, & Pickett, 2018). The situational context of criminal opportunities and differences at the individual offender level affect the framing of offending decisions. Expected utility theory assumes individuals are motivated by the psychological value of final assets (e.g., level of wealth). By contrast, prospect theory assumes that decision makers are most concerned with changes—gains or losses—relative to a reference point (Kahneman & Tversky, 1979). This reference point can be either the status quo, or expectations that are specific to the individual or more generally adopted (Kahneman, 2011; Thaler, 2015). In addition, in prospect theory, "losses hurt more than equal gains please" (McDermott, 2004, p. 298), leading to loss aversion. When viewed from a point of reference, prior gains or losses should affect the extent to which offenders are risk averse or risk seeking (Lattimore & Witte, 1986). Evidence from observational studies of criminal offending has started to accumulate in support of this perspective (Bushway & Owens, 2013; Loughran et al., 2012; Pogarsky et al., 2018).

Here, we explore offender decision-making in response to crime control and prevention measures guided by a bounded rational choice

[1] Cornish and Clarke (1986), departing from Becker (1968), added effort to the cost of committing crime. Unfortunately, we do not have a good understanding of how offenders integrate effort and risk when assessing the cost of offending. Beyond the expectation that *cost* = *f* (*effort*, *risk*) monotonically increases under most circumstances, the behavior of the function is not well known.

[2] The focus of our research was on offenders with multiple convictions for acquisitive crimes. Affective and violent crimes involve different cognitive processes, sometimes referred to as hot versus cool processing (Pogarsky et al., 2018).

perspective. We examined offender perceptions of effort, risk, and reward, and the choice to persist, desist, or displace. In this thematic analysis of the offender narratives, we were attentive to the presence of elements from prospect theory, including the use of heuristics, and in how offenders framed their understanding of the situation and their decision options.

3. Methods

Semi-structured interviews were conducted with 200 adult offenders, either in jail or on probation, under the authority of the Texas Department of Criminal Justice, from 14 counties.[3] To be included in the sample, an offender had to have a minimum of three convictions for auto theft, vehicle burglary, residential/commercial burglary, shoplifting, and/or street/commercial robbery. Both passive (e.g., posters) and active (e.g., site visits) recruitment efforts were used. Offenders were asked about their decision to persist, desist, or displace when confronted with a crime prevention or crime control measure.

All data were collected through face-to-face interviews by the two authors and two research assistants, between November 2014 and March 2016 (the study received IRB clearance on November 6, 2014; IRB ref. 2014Q4271). The data collection team consisted of two white females, one Hispanic female, and one white male; two of the females were bilingual and able to conduct the interviews in Spanish. The subject group was 86% male, 14% female, 25.5% white, 27% black, and 41.5% Hispanic, and ranged in age from 18 to 67 years (mean 33.2, median 31, SD 11.9). After a training phase, all interviews were conducted one-to-one. Rapport was readily established with most subjects, though a small number appeared distrustful or offered relatively less information. Interviews ranged in length from half an hour to two hours, with most lasting between 45 and 90 min.

Although many subjects admitted to having committed a variety of crimes, all had a single offense type they "specialized" in or preferred, and this was what we focused on for the crime type-specific interview questions. When classified this way, our sample was split into 32% burglars (25% residential, 7% commercial), 31% shoplifters, 25.5% vehicle offenders (17% vehicle burglars, 8.5% auto thieves), 11% robbers (6% commercial, 5% personal), and 0.5% other (theft by check).

The study used mixed methods in that the interview format included both open-ended questions akin to those employed in previous ethnographic research, and a series of scenarios similar to those used in studies employing the hypothetical scenario method. Each interview consisted of three parts: (1) offender experiences; (2) a crime control measures survey; and (3) situational crime vignettes. Subjects were first asked about their experiences involving situations in which they wanted to commit a crime but chose not to do so due to a crime control or prevention measure. We explored why they made the choice they did, what they then decided to do, and their assessments of any changes in effort, risk, or reward. This part of the interview largely consisted of open-ended questions and was completed first so as not to influence participants' responses.

Next, subjects were asked to assess the effect of a standard list of control/prevention measures for their particular crime type, to explain why they thought the measure did or did not have an effect, and, for the former, to indicate their chosen desistance or displacement response. Finally, participants were given a series of situational vignettes, each describing a prevented crime situation, followed by five displacement options and a desistance option. The second and third parts of the interview were mostly quantitative in nature in that answer options were predetermined for each question, although subjects were able to discuss and elaborate on their responses.

We were unable to directly transcribe the interviews as permission was not granted to audio-record them. Instead, elaborate data collection forms were developed, and interviewers used these and their laptops to take detailed notes during the interviews, including verbatim quotes. Care was taken to provide time after each interview for interviewers to write out their notes in full (from abbreviated annotations) and to add to them while their memories of the interview were still fresh. It is these notes that provided the basis of the thematic analysis (Braun & Clarke, 2006; Miles, Huberman, & Saldana, 2014).

Both authors used NVivo to analyze the data independently of each other. The first step involved familiarizing ourselves with the data by reading all the interview notes. On subsequent readings, initial codes were assigned, which were refined and developed as data analysis progressed. Code refinement involved slightly modifying the scope and meaning of the code so that new data points could be related to such codes in a more meaningful way. For example, a code yielding many instances could be refined to be more specific to tap into greater complexity.

After initial coding was completed, attention was paid to how codes co-occurred in the interview notes, and how subjects themselves viewed the relationships between codes (and concepts). It is these relationships that constituted the basis for the emergence of the initial main themes. At this point, the two authors jointly reviewed and discussed the themes. This involved comparing the themes, codes, and excerpts identified by each researcher, and arriving at a shared understanding of the data. The main themes were finalized by clearly defining and naming them; each theme so identified was sufficiently distinct from the others to justify its designation.

As we were interested in contextualized understanding, our study was more exploratory than confirmatory in nature. By allowing offenders to describe in their own words how they made their choices and what influenced such decisions, we hoped to develop a deeper understanding of criminal situational decision-making and its influences. The explanations and experiences discussed by subjects during their interviews provide a nuanced perspective of their offending choices. The qualitative data also revealed a number of exceptions to rational thinking, hence our decision to fully explore this dimension with the present analysis. The quantitative results of the study are reported elsewhere (Rossmo & Summers, 2021; Summers & Rossmo, 2019).

3.1. Limitations

As participants were required to have at least three convictions, our findings may not be as relevant to less prolific or inexperienced criminals. Selection from jail and probation could also mean our subjects were less successful in avoiding arrest than other offenders, although they generally reported low overall arrest rates. Prolific criminals may be expected to be more persistent and hence more motivated. These factors should be considered when interpreting the transferability of the findings.

Subject veracity is a concern in offender interview research; some individuals downplay their culpability, while others exaggerate their criminal exploits, particularly their successes. We checked for internal consistency within narratives during the interviews and, when necessary, questioned and clarified the claims. For example, if a subject made a statement but later appeared to contradict themselves, the interviewer asked them to explain. In some cases, the apparent conflict was resolved from the context of the two situations, deepening our understanding of the phenomena under study. Other instances were the result of miscommunication, which we were able to address and correct through this process.

4. Results and discussion

Our thematic analysis showed effort, risk, and reward, while central to offender decision-making, were not always considered in a rational manner. Instead, deviations from an expected utility framework were

[3] These included Bell, Bexar, Brazos, Caldwell, Fort Bend, Galveston, Harris, Hays, Hidalgo, McLennan, Potter, Tarrant, Taylor, and Travis Counties.

frequently observed. For example, many of the offenders in our sample used intuition and heuristics in their decision to offend. Intuition played an important role in target selection and risk assessment. The likelihood of an occurrence (such as the chance of getting caught) was typically based on experience and often evaluated through the availability heuristic. Anchoring and sunk costs appeared to be important to the maintenance of criminal careers and selection of operational methods.

A number of offenders reported dual motivations, divided into "needs," such as a drug fix, and "wants." Drug addiction also appeared to influence reference points and recalibration of the offending value function. The concept of "need" further suggests the relationship between the value of a stolen item and its utility to the offender is not necessarily linear; rather, there is a discontinuity, a quantum jump, at the point where the need becomes fulfilled.

The most potent influence on criminal judgment in our sample was the use of drugs, a practice that often distorted an offender's perceptions and logic. These, and the other identified themes, are presented and discussed more fully below.

4.1. Theme 1: offenders rely on intuition and luck

Offenders often used intuition (mistakenly referred to as instinct or a "gut feeling") when selecting targets, assessing risk, and deciding to persist or desist. Humans employ two types of decision-making process: the intuitive, and the rational (Kahneman, 2003). Intuition is a System 1 process that typically engages the use of heuristics. It involves thinking by analogy, matching evidence and situations to patterns based on stored experiences and knowledge (Stubbins & Stubbins, 2009).

Intuition falls between the automatic operations of perception and the deliberate operations of reasoning. It is fast and powerful (Myers, 2002). While such ease can be seductive, intuition functions outside of conscious awareness (Heuer Jr., 1999). It is helpful if based on experience and expertise, and when a decision has to be quickly made under conditions of uncertainty. However, because of its implicit nature and reliance on cognitive shortcuts, intuition is difficult to control or modify. It can be influenced by emotions and is often error prone (Rossmo & Pollock, 2019).

Many offenders acknowledged the role of chance and luck; over a quarter of the sample referenced this factor even though the interview did not include any directly related questions. Some criminals were outright superstitious about their intuitive perceptions.

> Subject BS034 said he would usually go with his "gut feelings."
> When Subject CR083 got a bad feeling from his "instinct," he would look for a different neighborhood in which to offend.
> "I got a gut feeling and never went back" (Subject CR012).
> Subject CR094 said he almost always committed auto thefts at night. "I'd take off walking, and wherever my gut said stop, that's where I'd start working [stealing cars]." "Nothing would really have to go wrong, it was just my gut feeling. I'd stop if things didn't seem right since I'm cautious."
> Subject BS011 said that a house with a dummy in the front yard really turned him off: "I got a gut feeling and never went back."
> Subject LS008 explained he'd get paranoid when using meth and that, if he couldn't shake that "funny feeling," he'd just go home. "Sometimes you get a funny feeling… a gut feeling that it's not right … I always go with my gut feeling … it's like a butterfly feeling something's not right."
> Subject CR066 described a time when he got a "bad feeling" when he was going to shoplift in a store. "When I went in, it just didn't feel right to me. I don't know if I was just scared or whatever, but they had more security. I was seeing stuff that wouldn't fit into my routine.... I didn't know for sure, just had a bad feeling." He changed department stores three times and then left and came back later.
> "After being on meth for so long, I became more able to read other people, it played like a movie in my mind, like a clairvoyant type of empathetic ability… We all have it [this ability], but you have to develop it, tap into it" (Subject LS013). He claimed he used meth to become more aware, to achieve a spiritual reality that helped him with his reconnaissance, which in turn lowered his risk.
> "There's risk in everything you do, you have to hope that luck is with you that night" (CR044).

4.2. Theme 2: heuristics often drive criminal perceptions and decisions

The anchoring heuristic plays an important role in the maintenance of many criminal careers. Anchoring occurs when an initial item of information becomes the basis for an individual's judgment. Early experiences of successful and lucky criminals are sometimes sufficiently rewarding that conventional alternatives pale by comparison.

> Subject LS007 claimed he could make $8000 in three days. "I want to have it all, like in the movies."
> Subject BS034 believed the lure of making more money in one day than what other people could make in a week resulted in him being willing to take more risks. He claimed he could make a "few thousand dollars in a couple of minutes." He found money to be so easily obtainable through theft that he thought it would be difficult for him to adopt to a conventional job and salary.

Logically foreseeable consequences did not always register unless the offender personally had a prior negative experience. Research shows previous arrests influence the risk perceptions of stranger rapists to the extent that crime scene behaviors have been used to predict their criminal records (Davies, Wittebrood, & Jackson, 1997). Stranger rapists who were masked were more likely to have been arrested through victim identification, those who wore gloves through fingerprints, and those who destroyed biological evidence through DNA.

The availability heuristic influences evaluations of the likelihood or frequency of an occurrence based on how readily examples come to mind. It plays an integral part in assessments of crime effort, risk, and reward as offenders primarily learn through their own experience and those of their co-offenders.[4] Consistent with the limitations of bounded rationality, these personal histories may result in idiosyncratic assessments if too much weight is given to a particular piece of information.

A criminal may avoid working with accomplices if they had previously been "ratted out." Subject CR058 explained that a bad experience with two co-offenders led him to the decision to commit all his future crimes on his own, despite many prior successful team burglaries: "I was the only one who did time on that. After that, I learned to do it by myself. I'm not going to snitch on myself." Subject KR002 preferred to work alone because involving others who were ineffective or untrustworthy increased the risk.

Some offenders had past experiences that appeared to disproportionately influence their assessments of risk and reward.

> Subject LS003, a prolific shoplifter, said: "I don't mess with those [retail ink anti-theft tags] … My damn cousin did that and she had blue all over her."
> Subject CR025 remembered how an older lady at the [Retail Supercenter] self-checkout station "cared – she was all about her job. Was watching me to make sure I paid." He said he was getting something for his kids. "I was trying to act natural as I pretended to scan. She made sure it made the beep. I told her [I'd] be back – [I] don't have [my] wallet." In contrast, he said "the younger generation

[4] The influence of false information on offender decision-making is an interesting but underexplored question. Criminals might make suboptimal choices even when behaving rationally if they believe something to be true (or false) when it is in fact not. Subject CR065 thought store security cameras had to be visible; "If they're hidden it's a violation of your constitutional rights – it is entrapment… Knowledge is powerful, and experience is powerful too."

don't give a shit. They're more worried about how they're getting fucked over by the company. Older people care."

Subject BS030 believed auto burglary was more lucrative than residential or commercial burglary, even though most offenders thought otherwise, as he reported once finding $25,000 inside a car.

There was little consensus among the subjects we interviewed on the relative risk and potential take of various crime types, perhaps because of previous personal experiences. Subject BS027 felt auto theft was higher risk compared to shoplifting, while Subject BS054 thought it was easier to get caught shoplifting than committing a commercial burglary (and the former was not as profitable). Subject CR073 said he wouldn't chance stealing a car, but would break into one to take its stereo. Subject BS035 believed there was a higher probability of getting caught committing a residential than a vehicle burglary. Subject BS077 thought there was a greater chance of being caught with auto theft. Subject BS065 thought risk did not really vary by offense type. "If you slip up, you are shit out of luck, so it doesn't matter."

The representativeness heuristic, a shortcut used to estimate probability through comparison to an existing mental prototype, was observed in offenders assessing the risks and benefits of residential and vehicle burglary offenses.

Subject CJ002 said they'd usually avoid places like trailer parks, as there wouldn't be much to take there. Instead, they prefer residential neighborhoods with two-story houses that looked nice, as this gave you an indication of the value of items that may be left inside their vehicles.

Subject CR009 remembered avoiding "uppity" neighborhoods where security measures would be more sophisticated and extensive. CR009 thought many people in lower income neighborhoods use "dummy" cameras instead of the real thing.

If Subject CR001 knew the owner of a house was a "redneck," he assumed they owned guns and would avoid the place because "rednecks are just waiting to shoot somebody."

Subject CJ001, an experienced shoplifter, applied this cognitive shortcut to his risk assessments. His modus operandi was to create fake receipts, and then use these to walk out of the store with stolen items. He explained how the receipt had to closely resemble a real one, but needn't be identical. As long as the ink color and other aspects were close enough, he would usually get away with the theft as staff on minimum wage would not be overly zealous when checking them. However, if a *younger, astute-looking person with a suit and a tie*—someone who looked like a manager—was at the front of the store, he would abort the operation, as this type of person would be likely to closely check the receipt. But if the individual was a teenager, or an older person, then everything would be okay.

4.3. Theme 3: uncertainty must be managed across effort, risk, and reward

4.3.1. Crime uncertainty principle

Crime choices involve more uncertainty than economic decisions. While the value of a house and the cost of its insurance premiums are readily determined, the yield of a burglary and the amount of effort and risk involved are less predictable. Criminals have their own version of the uncertainty principle[5] because of the need to make trade-offs between effort, risk, and reward. The decision to offend can be structured in different ways. Offenders who want set rewards have to accept more uncertainty for the level of effort required or the amount of risk involved. The number of offending attempts and associated perils needed to reach a monetary goal is unknown. Conversely, offenders can control the amount of effort they will invest, but only by increasing reward uncertainty. The achievement of a higher return may also require more than the usual calculated risk. Subject BS068, for instance, said his need for money would sometimes cause him to chance breaking into larger homes, which he thought riskier. Subject KR002 said that more money (i.e., a higher take) meant more problems. Subject CJ002 felt the proceeds of a theft from a vehicle were simply "luck of the draw."

"I would take orders from people who wanted things from [Retail Supercenter] and nicer stores. I charge more … for the more expensive stores because of the chance I'm taking there. The nicer stores like [Department Store] have better security" (Subject CR066).

"I would make less of an effort after realizing that I was not getting caught"

(Subject BS069).

Fig. 1 illustrates an example of the requisite trade-offs of the crime uncertainty principle. Benefit, effort, and risk are located at the triangle's vertices, while the colored circles mark different decision points. The lines from the circles to the different vertices are the uncertainty levels. The decision point marked by the red circle (on the left) shows a rough balance between benefit and risk, with a reduction in effort. The decision point marked by the green circle (on the right) involves less risk, but at the cost of greater uncertainties in benefit and effort. Decreasing the uncertainty for one factor can only occur by increasing it for one or both of the other factors.

Fig. 1 illustrates the tradeoffs between benefits, efforts, and risk in offender decision-making related to property crime.

Ekblom and Hirschfield (2014) argue that, for crime prevention purposes, risk, effort, and reward are interchangeable currencies and cannot be seen as isolated factors; rather, they should be regarded as part of a holistic decision agenda.

4.4. Theme 4: rewards are subjective and fluid

Several offenders ($N = 76$, 38%) reported dual motivations, divided into "needs"—basic survival requirements, drugs, or money to pay a fine—and "wants." For example, some female shoplifters with children talked about stealing for survival, for food, rent, diapers, and other living necessities. But they also stole luxuries. The amount of effort they expended and the risk they accepted for stealing necessities was higher than for stealing luxuries. For other criminals, the need to fill an "order" (a request for a particular item, such as a high-end designer purse), rather than the desire to steal something for themselves, influenced

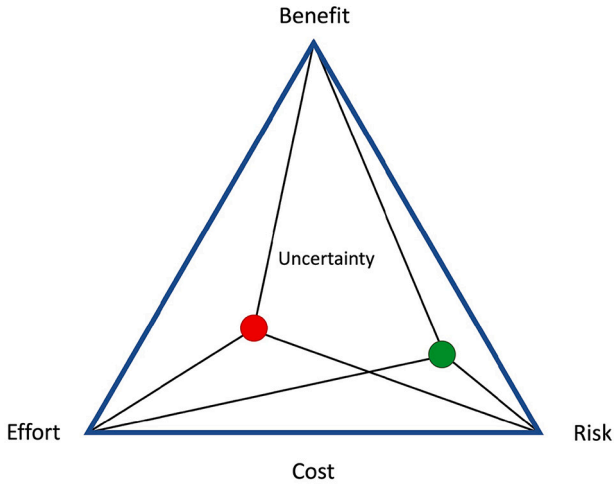

Fig. 1. Crime uncertainty principle.

[5] The Heisenberg uncertainty principle is a mathematical inequality in quantum mechanics; it states that the more precisely the position of a particle is known, the less accurately its momentum can be determined, and vice versa.

effort expenditure and risk taking. However, the most potent and distorting motivation was the need of certain offenders to fund their drug habit:

> Subject CR035 said, "until you get what you need, you're going to keep going."
> Subject CR083 explained, "Just 'cause, if we needed money, we were going to do it regardless. If it wasn't in one neighborhood, it was at another. If something didn't seem right, we'd go to another one."
> Whether Subject LS009 would try a different approach if his efforts were thwarted depended on whether the beer he was trying to steal was for his own personal use or for an order. For the latter, he would be more persistent, go to another store and take more risks; "it's different if there's an order to fill."
> Subject KR002 was more motivated if there was a need for her family, or if a customer wanted a specific item shoplifted.
> Subject BS078 was willing to take more risks and make more of an effort if it was for his children.
> Subject BS049, by contrast, said he would go home if he encountered a risk when stealing for his family, but would accept more risk or put in more effort if he needed money for drugs.
> CR070 said she was much more strongly motivated to steal for living and drugs than when she shoplifted for cosmetics (which was sort of a "hobby").
> CR095 said he would rationalize stealing no matter what he encountered because he had to get money for his habit. "Then, I would evaluate and think, no that's not a threat, or just be desperate. I wasn't going to kill anybody, you know. I might have to run, but I needed the money for drugs. I didn't think I had a choice."

Need is also a function of available resources—the amount of money or drugs the offender has in reserve or can obtain elsewhere, such as from family or friends. Subject LS005 said she knew drug users who were desperate, but thought she would be okay if she was unable to commit a burglary because her brothers would help her out or she could pawn something.

This dual motivation has implications for understanding the subjective nature of reward, perceptions of effort and risk, and the choice between persistence, desistance, or displacement. Further complicating the measure of reward is the difference between the actual cost of a stolen item and its "net profit" for the offender. Shoplifters, for example, realize different value depending on what they do with a stolen item. It is important to take into account factors affecting offender perceptions of the cost-benefit ratio of crime when designing or implementing crime prevention and control measures.

Costs and benefits in crime involve multiple components, suggesting the need to deconstruct them to fully understand offender decision-making. Effort involves both the search for and probability of finding a suitable target, followed by the actual commission of the crime. Risk derives from the probability of arrest/conviction and the severity of punishment. Benefit or reward is based on the value of the stolen items and, with the exception of cash, the ease and rate of their exchange (that is, how readily the items can be sold for money or traded for drugs, and at what conversion rate). For example, shoplifters realize full value for items stolen for personal use, about 50% for items passed on to others, more for items stolen on "order" (such as particular designer purses), and much less (as low as 10%) for items sold to pawn shops.

To summarize, crime costs and benefits can be deconstructed into:

- Costs
  - o effort
    - ▪ search for target
    - ▪ commission of crime
  - o risk
    - ▪ probability of arrest/conviction
    - ▪ severity of punishment
- Benefits
  - o value of stolen items
  - o ease/rate of exchange

4.4.1. *Offending value function*

Prospect theory argues that some heuristics and biases are explained by individuals making choices based on perceived losses and gains rather than on absolute costs and benefits. People are risk averse under certain conditions but risk seeking under others. In contrast to the traditional linear and symmetrical expected utility theory function, the prospect theory value function is S-shaped and asymmetrical (see Fig. 2). Value changes are steeper for losses than gains, so loss aversion favors stability over change (Kahneman & Tversky, 1979). The perception of the likelihood of an outcome is distorted for both high and low probabilities.

Fig. 2 shows the relationship between value, gains, and status quo as described by prospect theory.

In prospect theory, the status quo is assumed to define the reference point for all attributes. "Many decision problems take the form of a choice between retaining the status quo and accepting an alternative to it, which is advantageous in some respects and disadvantageous in others" (Kahneman & Tversky, 1984, p. 348). Certain offenders, however, may not have the option of maintaining their status quo.

As addicts must regularly get drug fixes to prevent the unpleasant physical and psychological symptoms of withdrawal, their status quo is unstable. A drug addict suffering from withdrawal does not adopt the new state as a reference point (at least not over the short term) and his or her value function is not recalibrated (see Fig. 3). Instead, the addict desperately tries to regain the prior status quo. An offender who steals for a fix is not acquiring a gain but rather is attempting to avoid the sure loss of withdrawal. There is now a strong incentive to offend; the marginal value of a gain from this point is high while the value of a loss is low. From the offender's perspective, the gain has become a "need." Even the anticipation of withdrawal may cause a shift in an offender's value perceptions, increasing the challenge of deterring drug users; "they're going to do whatever they got to do in order to pay for their habit" (Subject LS002). This same shift in the status quo might also be applicable to certain violent crimes precipitated by offenders trying to regain perceived lost respect.

Fig. 3 shows the effect of a status quo shift on the value function position.

4.4.2. *Quantum jumps*

The concept of need suggests the relationship between the value of a stolen item and its utility to the offender may be discontinuous if there is

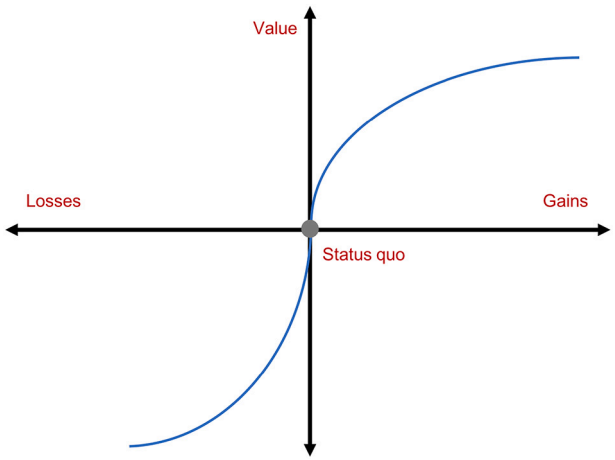

Fig. 2. Prospect theory, original status quo.

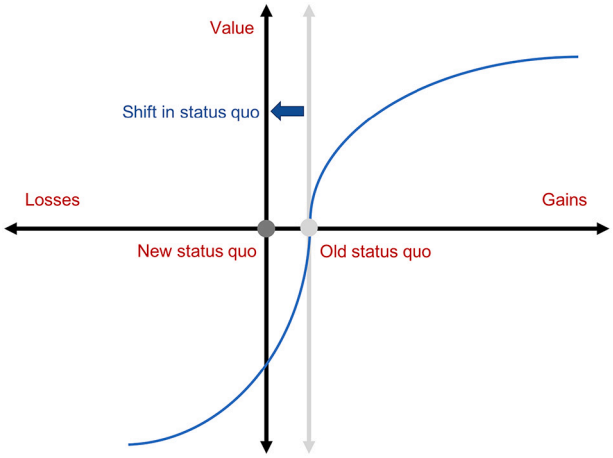

Fig. 3. Prospect theory, new status quo.

a singularity at the point where a drug purchase can be made (some subjects reported habits costings hundreds of dollars a day). "[I really had to] come up on something. I was struggling so hard. I needed to eat, I needed my drugs" (Subject CR075). Any less than this fails to meet the critical objective, requiring further offending, while any more has a lower relative value because the excess is unnecessary for the immediate objective. Subject CJ001's minimum theft goal was $1000; if he selected a cheaper item (e.g., a $500 vacuum cleaner), he would have to steal multiple items (e.g., two vacuum cleaners) to reach his goal.

Fig. 4 shows the hypothesized value function for such a relationship (e.g., a drug-using criminal in need of a fix). While all gains have some value, the slope remains relatively shallow until sufficient money has been stolen to purchase the needed drugs; at this point the value function rises steeply. The utility of the final gain is much higher than any previous gains. Within the region of this step, the value function behaves in a quantum fashion; it lacks continuity, one of the basic axioms of rational economic theory.

Fig. 4 illustrates a hypothesized quantum jump value function where the status quo is a need.

Such quantum jumps are not limited to drug users. They also apply to anyone who needs a specific amount of money such that anything less has limited value; for example, a person who has a debt with an impending payment due or must come up with the rent in order to avoid eviction. For these individuals, it is a matter of all or nothing.

Efforts to model criminal decision-making may be confounded by mental illness and personality traits that influence assessments of risk and reward (Altikriti, 2021; Jones, Hewson, Sales, & Khalifa, 2019). Impulsivity and low self-control, in particular, characterize many offenders, making them less likely to consider the long-term consequences of their actions while overemphasizing immediate gratification (Gottfredson & Hirschi, 1990); "those with low self-control place more weight on the 'here and now' and fail to consider or appreciate the long-term costs associated with satisfying one's hedonistic impulses" (Jones, Lynam, & Piquero, 2015, p. 540).

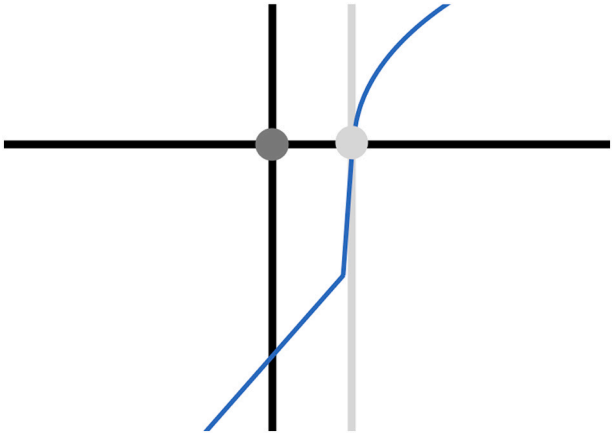

Fig. 4. Quantum jump.

The lack of concern by psychopaths for the consequences of their actions may be a product of an abnormally constricted time horizon (Lilienfeld, Hess, & Rowland, 1996). Psychopathic criminals make up approximately 20% of prison populations and are responsible for more than half of all serious crime (Hare, 1993). The inability of such offenders to anticipate punishment or perceive future losses suggests risk perception does not have a strong influence on their choices and behavior.

4.5. *Theme 5: drug and alcohol use distort risk perceptions*

Those who offended while under the influence of drugs and/or alcohol (comprising at least 70% of our sample) were more willing to take risks, which they perceived in a highly distorted manner. "I didn't care" was a common explanation. In addition to increasing motivation and distorting risk perception, a few subjects reported drug use increased their courage and confidence, while removing any feelings of guilt.

> "We are risk takers. We are not sensible people" (Subject BS020).
> Subject LS002 claimed nothing will deter drug users. Meth users are not in their right minds and "think they're Superman."
> "[Methamphetamine] fueled all my actions, gave me all the energy, the nerve to go and do the burglaries, like nothing is impossible" (Subject LS008).
> "Subject CR001's meth addiction gave him the courage to commit his crimes. He felt invincible and didn't have good judgment because of this "Superman" feeling.
> "Once I took Xanax I had no control" (Subject BS076). He thought everything was easy, took more risks, and did not care about anything going on around him. "Everything has a risk."
> "I didn't care if I got caught. I just wanted to keep the party going" (Subject BS023).
> "When I am on drugs I just do the crime and I do not care about anything… you do not think about anything twice, you do not use your mind" (Subject BS014).
> "I did not care… I would do it with cameras or with people watching me… I would have done it with a gun on my head when I was on Xanax" (Subject BS082).
> "Everything was connected to dope … I was high most of the time in all of the situations, I did not care when I did it or what happened to me" (Subject BS001).

While drug use typically lowered offender risk aversion, in some situations it heightened suspicion levels. Subject CR089, a heroin user, explained that being high increased both his courage and his paranoia. He told the interviewer that a large discount department store uses "fake kids" with cameras in their eyes. "I've seen it!" A secret shopper pushed the dummy kid around in a shopping cart. "That's how I got caught one time."

4.6. *Theme 6: for some offenders, risk is more a reward than a cost*

Another challenge for rational choice theory is the inconsistent perception of risk held by some criminals. Although most offenders had a lower tolerance threshold for risk than effort, a number of thrill seekers actively sought out risk and several mentioned being motivated by adrenalin.

"My motivation to commit crimes varied across crimes. Sometimes it was money, and sometimes it was the thrill of doing it" (Subject BS038).

Subject CR016 thought house burglary was scarier than breaking into trucks, but liked the "rush" he got from the fear.

Subject CR045 said he liked the feeling he got when he was about to commit a burglary. "When I set out to do it, it was just something that had to be done, the excitement hit me, and I got going."

"I guess it would enhance the feeling you got, I can't find the word, like … heart rushing, adrenaline rush" (Subject LS004). Using marijuana at the time of the crime increased the reward because it accentuated the rush from offending.

Subject CR049 said the amount of planning involved in the crime depended on whether they needed money, or were just looking for a thrill.

The danger of breaking into a stranger's house has been noted as a compelling attraction for some sex offenders. "Once I did break into the houses the rush was incredible.... And once I got away with it, I went to more dangerous things, more daring.… I preferred that rush over anything else" (Wood, Gove, Wilson, & Cochran, 1997, p. 358). For these criminals, risk is a reward, not a cost of crime. The interconnection between effort and risk and their relationship to a comprehensive cost assessment is apparently not straightforward. A related phenomenon, albeit one we did not pick up in our research, is how *reward* uncertainty may result in a greater release of dopamine, a neurotransmitter associated with pleasure (Robinson & Anselme, 2019).

5. Conclusion

A full understanding of offender decision-making is important for public safety. While researchers have traditionally applied expected utility and rational choice models, some of the underlying assumptions of these theories are violated in this context. Crime choices involve more uncertainty than economic decisions. Rewards can be fluid. Costs include both risk and effort. Cognitive biases distort a criminal's perceptions of these influences. Dual motivations, involving needs and wants, affect reference points and introduce discontinuities that distort the offending value function. The need for drugs and/or alcohol has a significant influence on the offending motivation of criminals, while dramatically distorting their assessments of risk.

Behavioral economics and prospect theory provide insights into understanding criminal decision-making. Cognitive heuristics and biases, such as intuition, influence offending judgment, particularly under conditions of high uncertainty. These influences are not necessarily consistent, and depend on idiosyncratic personal experiences and a criminal's sobriety level at the time of offending.

While prospect theory and behavioral economics have important implications for understanding offender decision-making, they have equally important implications for the effort to develop effective crime prevention and control strategies. Such efforts must consider how offenders actually perceive costs and benefits if they are to be effective, and if they wish to avoid unintended negative consequences.

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Declaration of interest

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