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Behavioral Perspectives on Risk Prone Behavior: Why Do People Take Risks?

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Abstract

Utilizing the principles and concepts of behavioral economics and operant psychology, researchers in both fields initiated the creation of the optimal foraging theory. This theory describes foraging behaviors mostly within animals other than humans. However, within recent empirical studies, optimal foraging theory has been modified to explain risky choices and decision-making processes within the context of risk-sensitive foraging theory for both animals and humans alike. Although most individuals belonging to the *homo sapiens* species would not like to admit that their behavior is very animalistic in nature, there is a great deal of veracity behind this idea, ranging from explaining gambling behavior to addictive behaviors to even homicide. Risk prone behavior describes behavior elicited for the potential gain of rewards under certain conditions, usually competitive in nature. The purpose of the current paper is to shed some light on this topic and how it relates to the most primitive of behaviors exhibited by human beings.

Keywords: risk-sensitive, optimal foraging theory, risk prone, decision-making, prospect theory

1. Introduction

In the fields of behavior economics and operant psychology, the conjunctive use of optimal foraging theory and prospect theory has spawned the development of risk-sensitive foraging theory. Although arcane, an examination of these theories provides a workable format for people in various occupations (e.g., law enforcement) and other institutions to better understand why people (or in many cases criminals) take risks while often fully aware of the consequences of those risks. This article will use basic behavioral principles in conjunction with foraging theory to produce examples of why people take risks.

2. Optimal Foraging Theory

MacArthur and Pianka (1966) pioneered optimal foraging theory and applied the theory to the description of the food-gathering and consumption behavior of animals and their expended energy during such tasks. Specifically, this theory describes how animals attempt to maximize food gathering and consumption, while minimizing the amount of energy required doing so. Pyke (1984) would later extend the theory into the human realm, but in so doing noted that like many scientific theories, optimal foraging theory is reliant on assumptions. Pyke asserts that an individual's foraging behavior impacts the next generation both in terms of geography (i.e., choosing the most prosperous location to live) and heritability (i.e., foraging behavior would be rapidly accepted by offspring as part of a rapidly changing phylogenic profile). Within the context of predominantly agricultural societies, optimal foraging theory with its risk-averse theme and predictive qualities led to adopting of risk-sensitive subsistence tactics within cultures (Winterhalder, Lu, & Tucker, 1999). This theory would predict that human settlements would be in areas of the planet that most consistently met needs and averted risks (e.g., starvation or natural catastrophe).

The extraneous and unpredictable qualities of climate, nature, and society would occasionally intercede with patterns built around expectancy (i.e., drought, famine, natural disaster, and war) and this would lead to migration and refugee status that necessitated an acceptance of a higher level of risk. This is reflected in the current immigration and refugee debates around the world. When subsistence becomes questionable, it leads to

greater risk tolerance in traveling – sometimes rough and hazardous distances – in hopes of again finding a pattern of living that is again maintainable in a different location (Smith & Winterhalder, 1992; Winterhalder et al., 1999).

A contemporary view of this theory in affluent society underscores situations where people try to make the most money while expending the least energy. Sometimes this takes us away from a traditional work ethic and makes us woefully underprepared for substantial economic shifts within countries and cultures (Smith, 1988).

3. Prospect Theory

On the other hand, prospect theory is more behavioral in nature. Kahneman and Tversky (1979) offered the prospect theory as a different approach to examine risky choices in lieu of the expected utility theory. Their theory describes choices being made in two parts: editing and evaluation. These phases refer to how one chooses a prospect (or choice) and why they choose that prospect in terms of higher paying outcomes. In editing, operations or analysis is conducted to simplify the field of choices for evaluation. Humans, like animals, have been shown to assess risk along the lines of asset gains and losses as opposed to accumulations of wealth (Kahneman & Tversky; 1979).

A good example of this might be the purchase of insurance. The rise of the highly profitable global industry of insuring against possible loss is essentially providing a hedge against major loss due to unexpected incidences or outcomes. The industry thrives on the fact that people are willing to pay installments due to risk aversion, when in reality most do not redeem these risks due to low probability of occurrence of accidents, illness or house fires. Most would come out financially ahead without the insurance; however, the random nature of risk is an aversion to most. So the vast majority of Americans in the middle class play the game by the rules and are insured.

The very wealthy, who often self-insure (meaning they can absorb losses internally), and the poor, who might feel they have little to lose, are generally the least concerned with risk and subsequently the least likely to insure against loss. Kahneman and Tversky (1979) note that a comprehensive theory of insurance behavior should consider – in addition to pure attitudes toward uncertainty and money – perceptions of individual security, social norms, and information/misinformation stipulating likely outcomes. So Prospect Theory plays a role in the current difficulties seen in the Affordable Health Care Act (i.e., the young and healthy see it as an unnecessary expense) and it will generally predict who is most likely not to have their car insured (i.e., the poor, or those who need transportation but can't legally drive).

4. Risk-sensitive Foraging Theory

McDermott, Fowler, and Smirnov (2008) have applied an evolutionary perspective in explaining cognitive and behavioral processes used in making higher risk decisions, specifically with humans. Overall, a blend of operant behavior principles and survival decision-making used in the optimal foraging theory and the prospect theory has made the use of *risk-sensitive foraging theory*, a popular application of empirical literature for the risky choices made by animals to survive in the wild. However, a new trend in experimental analyses has shown significant relevance and potential in applying this theory to risky human behavior as well.

Caraco, Martindale, and Whittam (1980) first described risk-sensitive foraging theory as an expansion of optimal foraging research in a series of groundbreaking experiments studying the feeding patterns of songbirds. These experiments demonstrated that a species of songbird were "risk averse" by training the birds to eat seeds out of a feeding station with either a constant or variable feeding schedule. Results of the study clearly indicated that the birds preferred the constant feeding of seeds and visited that feeding station more often in order to reduce the "risk" involved in using a variable feeding station that produced a feeding of either zero or six seeds at each visit (Caraco et al., 1980). Other researchers have demonstrated this same concept with a wide array of other animals and have shown that most other animals are risk aversive as well, including shrews and humans (Sinvero, 1997).

5. Humans Versus Animals

It appears as if both animals and humans are more likely to engage in risk prone behavior when their energy levels are restricted and when there is a higher incentive involved. An example of risk prone behavior exhibited by animals in terms of foraging would be a state of starvation, as seen in common shrews, which are constantly hungry due to their natural, high levels of energy expenditure (Sinvero, 1997). So, in essence, an animal is said to be risk sensitive when manifesting specific risk prone (in states of deprivation) or risk aversive (in states of satiation) behaviors. Preference of a certain outcome is indicative of risk aversion. With this in mind, it is not surprising to see political unrest in countries (e.g., Venezuela, Sudan, Ethiopia, Somalia, Syria) where a climate of deprivation is prevalent. While the politics of the situation often dominates attention in these situations, the driving force behind unrest and refugee behavior is most likely the unpredictable availability of necessities. The

same holds true when examining higher crime rates in the poorer parts of big cities (i.e., diminished resources equals risk sensitivity).

6. The Role of Context and Need

In order to create a foundation of comprehension for risk sensitive foraging theory and how it applies to human behavior, it is imperative to discuss the roles of context and need in the process of making risky decisions. The role of context in risky decision-making can be elaborated upon in numerous ways, however one main focus of several researchers has been that of the temporal context (Meyer, Schley, & Fantino, 2011). It is suggested that, in some cases, humans prefer reinforcers that are highly effective and are on a brief temporal delay, as in the concurrent-chain schedule used by Meyer et al. (2011). Those studying reinforcer trends in adolescents (Houlihan, Jesse, Levine, & Sombke, 1991) have noted the trend towards reward immediacy for some while. This makes the broad appeal of computer-generated games, smart phones, text messaging, and social media very understandable along with the shift from more goal-oriented and time intensive activities (e.g., higher education or mastery of musical instruments). The reinforcement level generated by a particular schedule might also explain shifts in choice of activities by youth. Historically favorite activities (e.g., fishing or playing ball) are being displaced by computer games and video games that might have richer schedules of reinforcement and a higher degree of immediacy. The same holds true for kids growing up in challenging neighborhoods where the wealthiest youth are engaged in the drug trade or gangs, and the poorer kids work at the fast food restaurant. Risk sensitive foraging theory clearly shows us why so many choose the more destructive path.

Besides the role of context in risky decisions, the role of need may hold a greater significance in the reasoning behind why humans make unpredictable decisions. For instance, this phenomenon is outlined by what Tversky and Kahneman (1981) coined as the "framing effect." The framing effect occurs when individuals perceive the need to make certain decisions in terms of gains or losses (Mishra & Fiddick, 2012). If an individual perceives a decision to be a gain, they are more likely to be risk averse when deciding how to reach an outcome, whereas if the decision is viewed as a loss, the individual will be more apt to make risky choices. An example of this effect can be demonstrated by such social dilemmas as posited by Blackstone's formulation; "Better that ten guilty persons escape than that one innocent person suffer" ("Blackstone's Commentaries," 1765). This mindset drives many political agendas, but it breaks down when the number of guilty significantly outweigh the number of innocent. With the framing effect, an individual is inclined to justify the decision of engaging in risky behavior by ascertaining the need to do so (Mishra & Fiddick, 2012). This phenomenon also makes clear why presidents and candidates so often call upon isolated examples of individual hardships or success stories when trying to introduce broad spectrum programs such as the Affordable Health Care Act, regulations on gun sales, or changes to immigration policy. The examples help to frame the initiative, but often sit near an edge of the continuum of concern.

7. Energy Budgeting and Temporal Discounting

Another related and important distinction in the risk sensitive foraging research literature regards the concepts of energy budgeting and temporal discounting. These concepts focus on the effort and time spent acquiring a behavior or arriving at an overarching outcome. Generally, energy budgeting refers to the amount of energy one can "spend" on performing a behavior, in the case of foraging theory, food and food consumption (Orduña & Bouzas, 2004). This would be the case in Caraco et al.'s (1980) study with songbirds. Individuals who have a surplus in their energy budget are more likely to be risk aversive in their behavior, while those whose energy budgets' are in a deficit are more likely to be risk prone in order to gain greater rewards or to survive (particularly in the case of animals).

With humans, Searcy and Pietras (2011) found almost identical results of how individuals make more risky decisions when their energy budget is negative and make less risky decisions when their energy budget is positive. This is readily seen in the tendency of those under greater financial stress to play the lottery. Lyon (2009) cites data suggesting that people living in households earning under $40,000 represented 53.4% of the frequent lottery players in South Carolina. What politicians often tout as revenue generating games that help a state's economy, are essentially a tax on the poor who often see the lottery as the most feasible pathway to improving the lives of their families. Likewise, a constricted budget is a common precursor to criminal behavior. The sad irony is the near certainty of eventual negative outcomes that generally lead to even more constraints on the budgets.

On the other hand, temporal discounting is a term used to describe how an outcome becomes less crucial and beneficial as the time it takes to get to that outcome increases (Yi, Buchhalter, Gatchalian, & Bickel, 2007). An example of this might be the tendency in the United States to see a burst in environmentally conscious efforts

towards alternative energies every time there is a spike in the price of fossil fuels. This is a pattern evident since about 1973, however, the crisis attitude (as well as the government funding for Green alternatives) tends to dissipate every time a new source of fossil fuels is found (e.g., fracking). Simply put, the panic has always subsided before a meaningful solution is put in place. Temporal discounting within the context of risk sensitive foraging research might infer a bleak outlook for solving world-wide problems such as global warming, pollution, and the dilution of critical reserves of minerals. Effectively challenging these problems will require very significant sacrifices on the part of the current generation to benefit a generation of people they will never know (Kazdin, 2009). Foraging theory would predict that we will likely fail at this effort.

8. Applying Theory to Modern Risk Taking

Although the majority of risk sensitive foraging research has been conducted using energy budgeting constructs, the impulsivity constructs used to define temporal discounting can be used in elaborating upon risky choices made by animals and humans. Specifically, Orduña and Bouzas (2004) conducted an experiment using pigeons that demonstrated that temporal discounting played a greater role in determining the choices pigeons made in regards to food, rather than energy budgeting. Similarly, another experiment conducted with opioid drug users found that temporal discounting was an essential component of making risk prone decisions during an iterated version of the "Prisoner's Dilemma Game," where fictional monetary rewards are distributed based upon an individual's cooperation with another player in the game. Playing this game produces results that demonstrate delayed gratification and measures of temporal discounting, suggesting that these aspects of decision-making with high stakes rewards (i.e., money) lead to a greater potential of making risky choices (Yi et al., 2007).

Research regarding the behavioral and cognitive processes of humans has corroborated these findings by indicating that humans with particular traits become risk prone to situations that could yield higher payoffs, such as engaging in gambling, using drugs, or committing crimes. These traits are often erroneously labeled as related to culture by politicians and law enforcement agencies, but they are generally environmentally driven. These deviant behaviors could be clarified by risk sensitive foraging theory and how behavior may be determined by other innate characteristics that comprise an individual's tendency to forgo societal expectations, standards, and norms. Interestingly, Deditius Island, Szalda-Petree, and Kucera's (2007) study of sex differences demonstrate that innate characteristics that men possess could explain risk sensitive foraging. For example, the study's results demonstrated that, in an analogue situation containing an energy budget model, men were more likely to be more risk prone with a negative energy budget, while women tend to be more risk averse in the same situations. Evolutionary and behavioral psychology principles were used to interpret these results, suggesting that women may be prone to more conservative and risk averse behaviors in most situations not involving protection of oneself and off-spring (Deditius Island et al., 2007).

9. Risk Prone Decision Making

Other innate characteristics that may elucidate risk prone behavior in humans include impulsivity, low self-control, and sensation-seeking behavior (Mishra, 2010). Mishra (2010) conducted an experiment to discover the underlying personality constructs that contribute to risk prone decision-making. With over 200 undergraduate student participants, the empirical study made use of different personality measures such as the Eysenck's Impulsivity Scale, Retrospective Behavioral Self-Control Scale, Zuckerman's Sensation Seeking Scale, and the Domain-Specific Risk Taking Scale. Participants also subsequently completed various measures of behavioral risk as well, like the Balloon Analogue Risk Task, Choice Task, Future Discounting Tasks (I & II), and the Variance Preference Task. Statistical analyses revealed support for the author's hypothesis, demonstrating that possessing the steadfast personality characteristics of impulsivity, sensation-seeking behavior, and low self-control are highly correlated with risky choices and provide a baseline for these risky choices to occur (Mishra, 2010).

With the explanation of risk prone behavior in humans comes a responsibility of providing additional logical and behavioral reasoning. This reasoning, tied to experimental analysis, has paved the way for demonstrating why humans engage in risky behaviors under circumscribed occurrences. One such occurrence in which certain people choose to engage in risk prone behavior includes drug seeking and consumption behavior. Bickel, Giordano, and Badger (2004) conducted a novel study assessing the risk sensitivity of the decisions made by a population of heroin users. These researchers developed an analogue task in which heroin addicts had to choose whether to hypothetically receive heroin on a variable schedule or on a fixed (constant) schedule. Other variables that were manipulated in these hypothetical situations included the amount of heroin, the strength of the drug, and the temporal delay in ultimately receiving the heroin. It was hypothesized that heroin addicts would be more risk prone in states of satiation and would be risk averse in states of deprivation.

Overall, Bickel et al. (2004) established support for their hypotheses and found that heroin addicts were risk prone in their behavior choices when they were acquainted with a hypothetical scenario in which they were in a state of heroin deprivation. In the instances of heroin deprivation, the addicts chose to "purchase" their heroin from a variable source, regardless of the heroin amount, heroin strength, or the amount of time that passed until receiving of the heroin. Thus, the addicts were risk sensitive to the variable source of heroin. This application of the risk sensitive foraging theory to the drug dependency of heroin addicts has demonstrated that opioid-dependent individuals act in a similar manner as other animals would in a state of starvation or other dire circumstances related to survival. This knowledge might provide valuable insight in combination the current opioid crisis in the USA.

Though Bickel et al. (2004) assessed the risk prone behavior related to hypothetically obtaining opioids, Kirshenbaum, Bickel, and Boynton (2006) conducted a study that evaluated the level of risk sensitive behavior involved with opioid-dependency and withdrawal. Specifically, this study hypothesized that individuals who are opioid-dependent and are experiencing withdrawal will tend to make more risky choices, in conjunction with the daily energy budget rule, or the energy budgeting aspect of some risk sensitive foraging models. The study recruited twenty-four participants of various ages who were in a treatment program in Vermont for opioid dependence. One-half of the participants used opioid drugs intravenously, while the other half of participants were intranasal opioid drug users. To participate in the study, participants completed a multitude of questionnaires that assessed their opioid usage, as well as measures that served as vignettes to describe hypothetical drug-seeking behavior. For example, participants were administered a questionnaire that measured their opioid consumption and usage behaviors. These measures assessed such consumption in a novel way to mimic natural "starvation" as postulated by energy budgeting rules and a risk sensitive foraging theoretical framework:

> All participants were asked to state their average opioid intake per day prior to treatment (in number of bags of heroin) and how much they would use over a 24-hour period given a free, unlimited, hypothetical supply of heroin. Participants were also asked: 'how hungry would you be for opioids on a typical day?' Participants then provided average daily opioid-hunger ratings using a 10-point scale ranging from 1 (satiated) to 10 (starving for opioids; Kirschenbaum et al., 2006, p.132).

In addition to the opioid consumption questionnaires, participants also completed a series of questionnaires that examined risk prone choice as well as opioid-agonist and opioid-antagonist behaviors. The risk prone choice assessment was nearly identical to the questionnaire originally utilized by Bickel et al. (2004) and described vignettes with different choices of drugs (fixed and variable sources) from various drug dealers.

To also support Kirshenbaum et al.'s (2006) empirical procedures, the agonist and antagonist questionnaires were also fictional in nature and assessed participants' feelings towards drug satiation and withdrawal symptoms and how those situations related to their overall level of "opioid hunger" (as evaluated by the opioid consumption questionnaires). The results of this study displayed that individuals who used opioids intravenously experienced greater withdrawal symptoms overall and were more inclined to engage in risk prone behavior. These results also reiterated the previous findings of Bickel et al. (2004), suggesting that opioid-dependent people make risky choices when a reward (e.g., heroin) is variable during a state of deprivation (Kirshenbaum et al., 2006). Deprived addicts are those most prone to overdosing.

10. Risk and Gambling Behavior

Alongside drug seeking and drug consumption behavior, another particular aberrant behavior in certain individuals has been reviewed in recent literature as well – gambling. In conjunction with the literature on drugs and risk sensitivity theory, gambling and risk research is largely conducted using hypothetical situations. Mishra (2010) used hypothetical situations involving gambling tasks to help explain risky decision-making in college students. Overall, it was found that students' attitudes towards risk in general were more predictive of risky behaviors than personality traits, like impulsivity.

However, an influential study conducted by Hayden and Platt (2009) analyzed gambling behaviors in humans with tangible, not hypothetical, rewards such as real money and juice (in this case, Gatorade) to increase ecological validity and expand implications. This aspect of the study is what makes it so noteworthy and quite the pioneer in human risk sensitivity of research. It is onerous to comprehend risk sensitive behavior in humans when only hypothetical reinforcers are used. Also, Hayden and Platt (2009) compared the results of their study, which demonstrated significant results for risk prone behavior with variable rewards, to studies that they have previously conducted with other primates. This comparison revealed that primates, specifically monkeys, engage in nearly identical risk prone behaviors as humans when presented with a reward of juice. Demonstrating this

phenomenon helps lay the foundation to bridging the gap between animal and human behavior and their relation to the risk sensitive foraging theory. Because the vast majority of research with risk sensitivity does not involve humans, it is captivating to see how the gaps in literature are finally coming nearer to a close.

11. Risk and Homicidal Behavior

Though the use of illicit drugs and engaging in gambling are quite risky behaviors for humans, a very interesting application of the risk-sensitive foraging theory could be applied to more egregious behaviors such as homicidal behavior. Daly and Wilson (2001) postulated that homicidal behavior in humans is often highly competitive and the decision-making process involved in such behaviors elicits a risk-oriented repertoire – differentiating situations of peril and risk. Specifically, with homicide cases, it has been demonstrated that murders conducted by individuals of the same sex who are unrelated often occur because of social status struggles and a sense of instinctual survival. In order to survive, humans, if not all species may resort to risk prone behaviors to benefit themselves.

Also, just as with the temporal discounting feature of the risk-sensitive foraging theory, researchers have demonstrated that individuals, specifically males, whom engage in risky criminal behavior are more likely to perceive the near future more significant in terms of consequences, rather than the distant future (Daly & Wilson, 2001). So, if it is more beneficial to the individual to commit violent crimes and engage in risk prone behavior in relation to immediate gains and rewards, the individual is more likely to commit the violent crime to either maintain or gain social status or to acquire other perceived recompenses. This differs significantly from individuals who are considered to be "law-abiding." Particularly, these individuals will focus more on long-term goals and exhibit more risk averse behaviors (Daly & Wilson, 2001). Temporal discounting has been related to violent and criminal behavior by demonstrating correlations between life expectancy outcomes, perceived risks, and survival instincts.

12. Conclusion

To conclude, although risk-sensitive foraging theory has been used to explain and expound upon the occurrences of extreme or socially undesirable behaviors in humans, the theory is also related to everyday issues that humans face. Although humans are considered to be a "higher order" species, individuals do not realize that humans are animals – just like any other creature in the animal kingdom and will behave similarly, contrary to what most individuals would like to believe about humans' superior status in the natural world. Every day showcases people competing for jobs, "hunting" and killing other people, and resorting to gambling and drugs to gain quick fixes to precarious or dismal situations. Such risk prone behavior can be seen in warriors and soldiers combating in a war zone and is demonstrated in spending more and more money, beyond one's means of living in order to pursue the "American Dream" and to "keep up with the Joneses". Instances of disrupted or rabidly accelerating schedules of reinforcement driving decision making behaviors often end up in cycles being compelled by "Irrational Exuberance" or unwise spending motivated by an overly optimistic view of the future. The foraging behavior exhibited by pigeons and rats in laboratory settings is just a simple manifestation of complex risky behavior exhibited by people. These behaviors explain evolutionary and adaptive theories and apply to most anyone. Indeed, humans are not that different from animals after all.

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