A Comparative Study of the Availability Heuristic and Risk-Sensitive Foraging

Rachel M. Donka
Seattle Pacific University
Learning and Cognition Labs

Purpose

- Cognitive biases, or heuristics, are established within psychological literature. However, little research exists determining the impact of heuristics on risky choice decisions or cognitive bias in nonhuman species.
- The proposed study seeks to determine if individuals, both human and nonhuman, rely on the availability heuristic in evaluating probability of outcomes, even when probabilities are objective and known.
- By analyzing choices of three different groups within a risk sensitive foraging model offering participants a constant and a variable option, reliance on heuristics can be measured to more fully understand cognitive valuation and choice.

Background

Risk-Sensitive Foraging Theory (RSFT):

- Risk-sensitive Foraging Theory (RSFT) was developed to explain a forager's shift in choice between a variable (risk-prone) or constant (risk-averse) option. In typical RSFT studies, a risk-averse choice yields a constant return, whereas a risk-prone choice yields a variable return.
- Studies of risk sensitive foraging in nonhuman species have lead to various models including optimal foraging, daily energy budget, scalar expectancy, and sequential choice, which model behavior with variations in reward amount, delay, probability and satiation.
- Studies of risky choice in humans indicate similar foraging behaviors as nonhuman species,. Additional models such as Kahneman and Tversky's Prospect Theory have been proposed to explain human tendencies to be risk averse with probabilistic gains and risk prone with probabilistic losses.

***Availability Heuristic*:**

- Heuristics are systematic cognitive biases that change how individuals perceive and relate to the world around them. The availability heuristic refers to the tendency to rely on ease of recall and strength of associations to draw conclusions regarding a frequency or probability.
- Heuristics are utilized when objective probabilities are unknown and when individuals have difficulty translating known numeric probabilities into tangible decisions.

Background (cont.)

- An analysis of online gambling by Ma, Kim, and Kim in 2014 indicated that individuals decreased or increased gambling in the short term following recent salient losses and gains. This indicates that individuals rely on availability even when probabilities are objective and knowable (see figure 1).
- Currently, no experimental data has been collected regarding the influence of availability on RSFT.

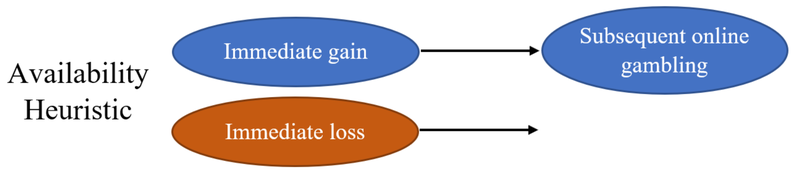

Figure 1. The influence of immediate gains and immediate losses on subsequent gambling according to Ma, Kim, and Kim (2014)

Proposed Experiment 1

- ***Subjects:*** 16 male Sprague-Dawley rats (*Rattus norvergicus*). The rats will be maintained at 85% of their free-feeding body weight.
- ***Apparatus:*** Lafayette operant conditioning chambers housed in Med Associates sound attenuating chambers are used as experimental environments (see figure 2).
- ***Procedure:*** A between-groups design with 3 groups, 32 trials. Rewards yielded will be 45 mg 100% sugar pellets. The constant option will yield 5 pellets and the variable option will yield 1 or 9 pellets.
- In Group A (the control), 16 forced choice trials will be interspersed with 16 free choice trials on a pseudorandom basis.
- Group B will be the positive availability condition. 4 forced choice variable option trials yielding 9 pellets will precede the remaining trials to induce the availability condition.
- Group C will be the negative availability condition. 4 forced choice variable option trials yielding 1 pellet will precede the remaining trials to induce the availability condition.

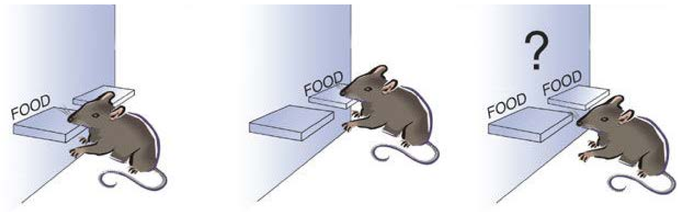

Figure 2. An example of the Lafayette operating chamber levers.

Proposed Experiment 2

- ***Subjects:*** 60 participants will be recruited from SPU
- ***Apparatus:*** Computer software designed through E-Prime and administered in the SPU Psychology Lab.
- ***Procedure:*** A between-subjects design with 3 groups, 32 trials. Rewards will be reported monetary amounts. The constant option will yield $5 and the variable option will yield $1 or $9.
- Group A will be the control condition. 16 forced choice trials will be interspersed with 16 free choice trials on a pseudorandom basis.
- Group B will be the positive availability condition. 4 forced choice variable option trials yielding $9 will precede the remaining trials.
- Group C will be the negative availability condition. 4 forced choice variable option trials yielding $1 will precede the remaining trials.

Discussion

- To date, few studies have examined the effects of the availability heuristic on RSFT or cognitive heuristics in nonhuman species. Literature regarding the influence of the availability heuristic when probabilities are knowable is lacking.
- Field studies of gambling behaviors have revealed a tendency for humans to be risk prone after a win and risk averse after a loss. Experimental data is needed to evaluate the relationship and strength of the influence of availability on RSFT.
- The proposed experiment would provide insight into the influence of availability on RSFT. Additionally, it would allow direct comparison between human and nonhuman cognitive bias, which has not previously been tested.