Reward Magnitude Effects on Sequential Risky Choices in Rats

Andrew T. Marshall
Kimberly Kirkpatrick
Kansas State University
Probabilistic choice

- Choice between an outcome that is uncertain and one that is certain

\[
P(\text{reward}) = 1.00 \quad 2 \text{ pellets of food}
\]

\[
P(\text{reward}) = 0.33 \quad 6 \text{ pellets of food}
\]
Probabilistic choice

- Choice between an outcome that is uncertain and one that is certain

- $P(\text{reward}) = 1.00$  
  2 pellets of food

- $P(\text{reward}) = 0.90$  
  6 pellets of food
Probabilistic choice

• Choice between an outcome that is uncertain and one that is certain

\[
P(\text{reward}) = 1.00 \\
2 \text{ pellets of food}
\]

\[
P(\text{reward}) = 0.10 \\
6 \text{ pellets of food}
\]
Probabilistic choice

![Graph showing the proportion of uncertain choices vs. probability of uncertain food]
Sequential probabilistic choice

- Risky choices do not always occur in isolation
- Differences in choice behavior depending on if choices are one-shot or sequential
  - Keren and Wagenaar (1987)
- The previous outcome of a choice has been shown to affect subsequent choice
Sequential probabilistic choice

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Sequential probabilistic choice

- Previous research (Marshall & Kirkpatrick, accepted)
  - Certain outcome: 1 or 3 pellets
  - Uncertain outcome: 0, 3, or 9 pellets
- How did choice behavior differ depending on most recent outcome?
Sequential probabilistic choice

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Collapsed across non-zero food

Proportion of uncertain choices

Probability of uncertain food

Collapsed across probability of food

Previous outcome

C-S  C-L  U-Z  U-S  U-L

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Previous outcome

C-S
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Sequential probabilistic choice

- P(uncertain food) = .90
  - E(certain) = 2.0 pellets
  - E(uncertain) = 5.4 pellets
- Win-stay / lose-shift behavior
  - Expected:
    - U-S 3-pellet outcome $\rightarrow$ shift to the certain side
  - Observed:
    - U-S 3-pellet outcome $\rightarrow$ stay on the uncertain side
Sequential probabilistic choice

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Sequential probabilistic choice

- U-S 3-pellet outcome was greater than E(certain)
  - Was the “win” relative to the certain side?
- If you win a “gamble” but the win is less than what you could have received for a more certain outcome, how likely are you to continue “gambling”?
Sequential probabilistic choice

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Methods

• 24 rats

• Choice:
  ▫ Certain outcome: 2 or 4 pellets
  ▫ Uncertain outcome:
    ▪ Group 1-11: 1 or 11 pellets
    ▪ Group 2-11: 2 or 11 pellets
    ▪ Group 4-11: 4 or 11 pellets
  ▫ 20-s FI between choice and food availability time
  ▫ P(uncertain): .1, .25, .33, .50, .67, .75, and .9
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Results: Global choice behavior

- Increase in uncertain choices with p(uncertain food)
- Group 1-11 chose the uncertain outcome least
- Expected value differences?
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- Similar expected values between the groups
  - Group 1-11: Lower uncertain choice behavior
- Effect of absolute magnitude of reward
Results: Global choice behavior

- Similar expected values between the groups
  - Group 1-11: Lower uncertain choice behavior
- Effect of absolute magnitude of reward
Results: Local choice behavior

- Effect of group
- Effect of previous outcome
  - Group 1-11 chose the uncertain outcome less than Group 4-11
Discussion

- What affected probabilistic choice behavior?
  - Probability of uncertain food
    - Increase in uncertain choices with \( p(\text{uncertain food}) \)
  - Magnitude of the uncertain-small outcome
    - Group 1-11 < Group 2-11 < Group 4-11
  - Previous outcome
    - Most like to gamble after winning a gamble
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• Estimated that 1.3-1.9% of American adults are pathological gamblers
  ▫ Welte, Barnes, Wieczorek, Tidwell, and Parker (2001)

• Implications
  ▫ Pyrrhic victories
    • Can the desire to gamble be attenuated by providing several wins that are less than a more certain outcome?
    • Is such a loss more salient than an unrewarded gamble?
    • Does this make gambling futile?
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Thank you!

- Acknowledgements
  - Drs. Kim Kirkpatrick and Tiffany Galtress
  - Jeffrey Hyder
  - My rats
- Questions?