Behavioral Economic Extensions to Assessments and Interventions for Individuals With Developmental Disabilities

Association for Behavior Analysis International 2021

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Presenters

- Brent Kaplan: Systematic Review of Applied Behavioral Economics With Individuals With Developmental Disabilities
- Elissa Spinks: Asymmetry of Token Gain and Loss in Individuals Diagnosed With Intellectual and Developmental Disabilities
- Shawn Gilroy: Incorporating the Elasticity of Demand into Behavior Analytic Evaluations of Reinforcers

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Operant Demand and Reinforcer Efficacy

Incorporating Elasticity of Demand into Behavior Analytic Evaluations of Reinforcers

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Objectives

1. Present Reinforcer Efficacy (RE) and measures of Relative Reinforcer Efficacy (RRE)
2. Define the elasticity of demand for reinforcers
3. Review two recent integrations of the demand for reinforcers in clinical demonstrations

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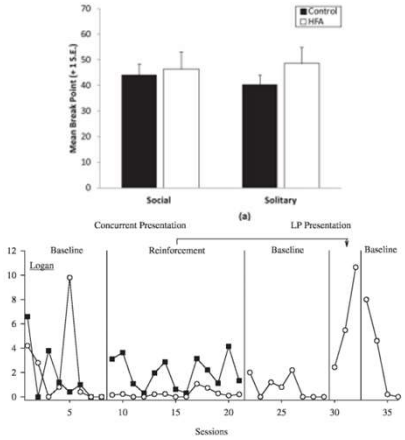
(Relative) Reinforcer Efficacy

- Reinforcer Efficacy (RE) refers to the size and degree of an effect that a stimulus demonstrates when contingent on behavior
- RE is revealed by examining how stimuli affect behavior
  - Reinforcer Assessment
  - Progressive Ratio Schedules
- *Relative* ratings of RE (RRE) use empirical indicators to rank and/or compare stimuli
  - Reinforcer breakpoint (top figure, Goldberg et al., 2017)
  - Total responses emitted (bottom figure, Francisco et al., 2008)



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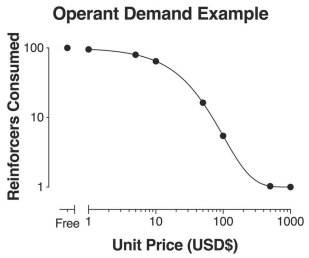
The Operant Demand Framework

- The Operant Demand Framework (hereafter, demand) refers to a collection of experimental methods and concepts derived from economic theory
  - Frequently used to evaluate how stimuli (hereafter, reinforcers) affect behavior
  - Economic methods are used to evaluate how various factors affect reinforcer consumption
- Reinforcer Efficacy (RE) is influenced by a number factors
  - Schedule requirements, i.e. unit price or cost
  - Availability of alternatives (for free/at different costs)
- Operant demand methods use *elasticity* to represent RE
  - Elasticity (eta) = relationship between costs, reinforcer consumption*
  - Elasticity is distinct from RRE (not interchangeable concepts)



*: Multiple forms of elasticity exist, but we refer primarily to price elasticity of demand
Note: Figure from Reed et al. (2020)

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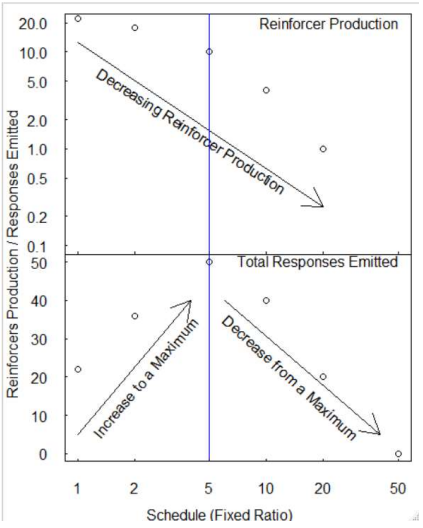
Elasticity of Demand

- Elasticity reflects how changes in price affect changes in reinforcer consumption*
- Elasticity is revealed when plotting changes in demand
  - For reinforcers: trend of *decreasing* reinforcer consumption when *increasing* schedule cost
  - For responding: trend of increases up to a point (price with maximum responding; P_{MAX}) before decreasing



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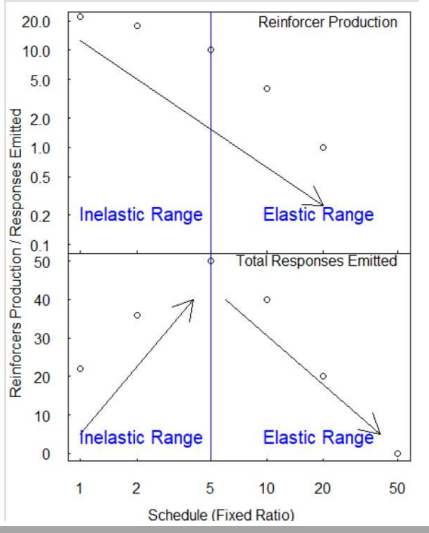
Demand and ABA

- Most reinforcer evaluations in ABA use RRE
  - RRE indicators are easily calculated, but do not directly inform function-based treatment
  - Examples include reinforcer breakpoint, response totals, etc.
- Few reinforcer evaluations have used elasticity
  - Schedules in the *inelastic range* = more stable
  - Schedules in the *elastic range* = less stable, approaches ratio strain



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Applications: Selecting Schedules

- Initial/terminal schedules often based on clinical judgment
  - Often default to FR1/CRF (*not efficient in terms of time/resources*)
  - Terminal schedules also arbitrary (*e.g., until problem behavior returns*)
- Demand methods can identify optimal schedules
  - Evaluate balanced contingencies (i.e., efficient response/reinforcer ratios)
  - Skip starts at FR1 and avoid other challenges (e.g., time cost, potential for resurgence)
- Gilroy et al. (2021) evaluated this elasticity-based approach
  - *Inelastic range* = indeed more stable, better response/reinforcer ratios
  - *Elastic range* = more erratic and more associated with ratio strain

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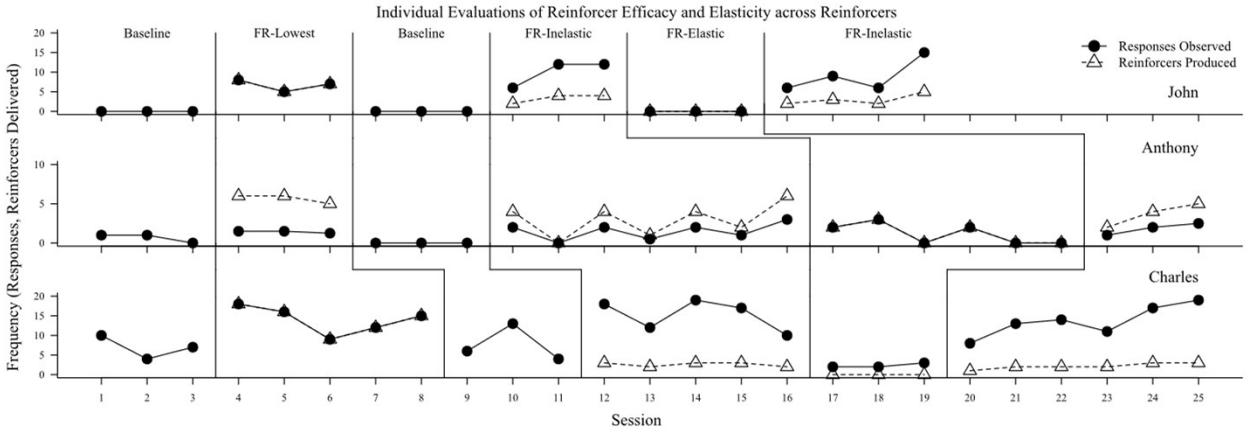
Gilroy et al. (2021)



Note: Figures drawn using the *fxl* package in the R Statistical Program

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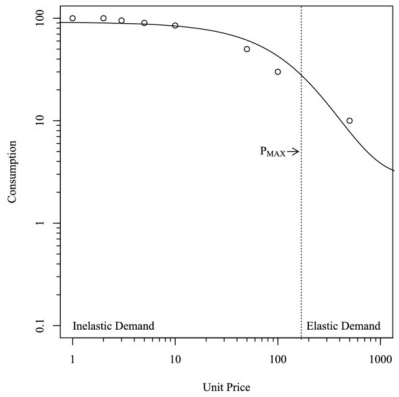
Takeaway: Gilroy et al. (2021)

- Demand and elasticity are useful in clinical practice
  - What schedules might be more reliable in treatment?
  - What schedules should we avoid in treatment?
- Elasticity can be evaluated rapidly and without statistical tools and evaluation*
- Elasticity provides information that RRE metrics does not (more than ranks)



Note: Figure from Gilroy et al. (2019)

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Applications: Increasing Work Output

- Most attempts to increase response output thin the schedule
  - Responses increase, contingent reinforcement remains the same
  - Essentially *increases the price* for the *same amount* of reinforcer
- Gilroy et al. (2019) used elasticity to increase work
  - Unit Price = response requirement/reinforcer magnitude
  - Selected price from the *inelastic range* of a demand curve
- Schedule *thinning* wasn't necessary
  - FR3 – 30s = 3 / 30 = 0.1, FR6 – 60s = 6 / 60 = 0.1
  - Work output *increased*, while *price* for reinforcer did not

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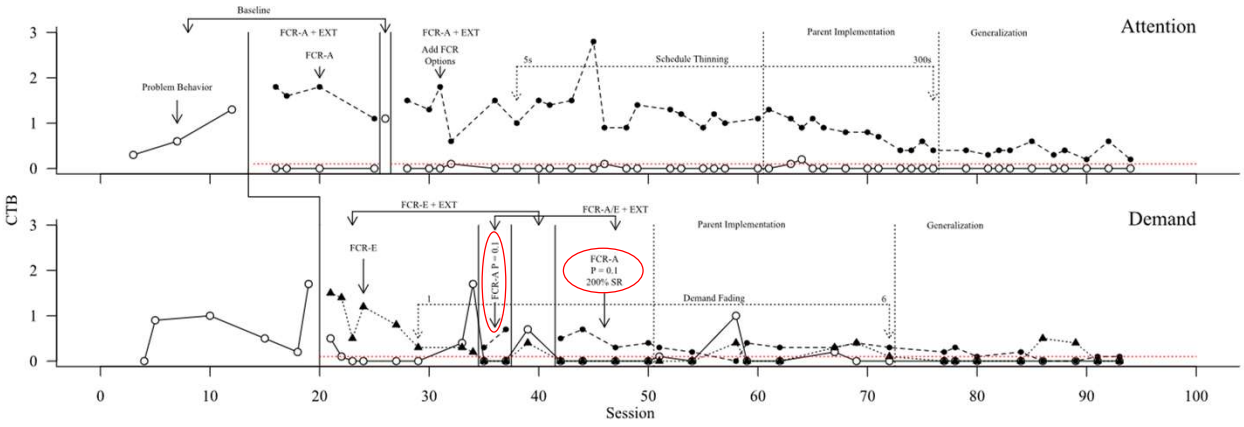
Gilroy et al. (2019)



Note: Figures drawn using the *fxl* package in the R Statistical Program

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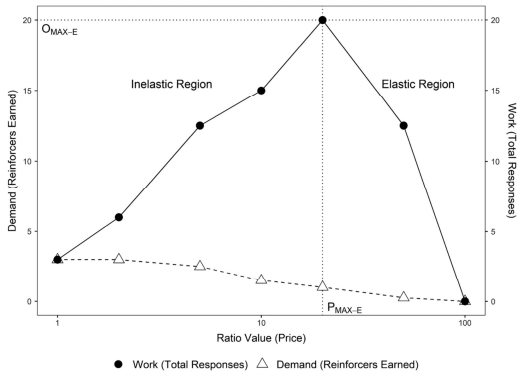
Takeaway: Gilroy et al. (2019)

- The demand curve furthers understanding of how response requirements relate to reinforcer production
- Elasticity is a useful concept for understanding how a range of unit prices should affect behavior
- Unit price logic can be used to ***increase response output*** without actually increasing the unit price (less likelihood of ratio strain)



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Discussion

- Few guidelines for selecting reinforcer schedules
  - Most use FR1 at the outset, which is expensive in terms of effort and resources
  - Most thin schedules until problem behavior returns, which is potentially unsafe/unethical
- Further evaluation of demand methods is warranted
  - Few clinical applications of demand evaluated in the literature
  - Nearly all evaluations use RRE rather than elasticity-based interpretations

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Next Steps

- Replication across social-positive and social-negative reinforcers
  - Access to social-positive attention
  - Escape from task demands/activities
- Cross-price elasticity with concurrently-available reinforcers
  - Both functionally similar and qualitatively different
- Elasticity in Token Economies

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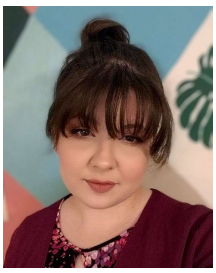
Acknowledgements



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