Using Functional Analyses to Inform Gambling Interventions

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Overview

• Goal for today:
  – Identify main categories tested within a functional assessment
  – Highlight methodological approaches developed to date to determine convergent validity
  – Outline potential clinical utility of using similar methodology for clinical practice
GAMBLING...

...any instance where a valued commodity is wagered in hopes of gaining something of greater value in return
What Do We Know About Gambling Addiction?

✅ Susceptibility of groups of people to develop a gambling addiction?
   - Are there certain people who are predisposed for greater risk of developing an addiction?

❌ Why do people develop gambling addictions?
   - Differences across gambling population?
     • Heterogeneous population when compared to recreational users, but are there idiosyncrasies within group?
GAMBLING ETIOLOGY

Risk factors that may lead to development of gambling addiction:
• Early big win (leading to false expectations of future wins)
• Easy access to preferred gambling activity
• Irrational beliefs about gambling odds and/or schedules of reinforcement
• Unmonitored gambling events
• Recent major life event (e.g., divorce, job loss, retirement, death of loved one, etc.)
• History of risk-taking and impulsive behavior
• Frequent feelings of boredom and/or loneliness
• Financial problems
• Few interests or pro-social hobbies
• History of mental health problems (e.g., depression, anxiety)
• History of abuse and/or trauma
• Parent/family members with history of substance use and/or gambling addiction
• History with substance use
What DON’T We Know About Gambling Addiction?

• WHY do people continue to gamble, even in presence of negative consequences?
  – Hallmark of disordered gambling

• What tools are effective
  – For identifying why people gamble?

• Effective treatment options?
  – What forms of treatment work best?
  – Are there specific treatment options for various “types” of gamblers?
Many Fringes of Therapy

- Psychodynamic
- Cognitive
- Pharmacotherapy
- Motivational Interviewing
- Empathy
- Behavioral
- Cognitive-Behavioral
Barriers to Successful Treatment Outcomes

- Disinhibition including impulsivity, sensation seeking, risk taking, identified as significant predictors of treatment failure (e.g., Ramos-Grille et al., 2015; Daughters et al., 2003).

- Cognitive distortions (e.g., Dixon, Wilson, & Habib, 2016; Dixon, 2000; Ladouceur, 2000)

- Personality, mood disturbances, negative affect, etc. (e.g., Blaszczynski & Silove, 1995; Hodgins, 2001; Ibanez et al., 2001)

- Lack of functional treatment, resulting in mismatched replacement behaviors and extended periods of extinction (Wilson & Glassford, under review)
  - Extinction induced phenomenon: resurgence, relapse, renewal, spontaneous recovery
The Behavioral Equation: Determining the Function

Antecedent A

Behavior B

Consequence C

The function of a behavior is determined by the consequences that follow the behavior.
Functional Assessment

- Direct Observation
  - Descriptive
    - CORRELATION
- Informant Methods
- Functional Analysis
  - Experimental
    - CAUSATION
Behavioral Interpretation

- 4 primary "functions"

- Attention
- Escape
- Tangible
- Sensory
Expanding the Role of “Functional” Characteristics

Antecedent
- Stressful Day at Work
- Socialization with Friends
- 2 for 1 buffet and Double Points
- Needing a “Rush” of the Game

Behavior

Consequence
- Feeling Relaxed
- Attention and Relationships
- Acquisition of “Good Deals”
- Neurochemical Changes

GAMBLE
Behavioral Conceptualization of Functional Interventions

- Positive and negative aspects of drug/gambling use before treatment

- During treatment, goal is to switch drug/gambling use to abstinence plus contingency management of sorts
Behavioral Conceptualization of Functional Interventions

- Positive and negative aspects of drug/gambling use before treatment

- During treatment, goal is to switch drug/gambling use to abstinence plus contingency management of sorts

- After treatment, goal is to continue with abstinence from drug/gambling use...
Functional Analysis

Motivating Operation

Increased value of relaxation
Function Analysis

Function-informed interventions

• Better treatment outcomes (Ervin et al., 2001; Petry, 2005)
• Offer more parsimonious theoretical account for behavioral change (Sturmy, 2007)

Functional interventions focus on why behavior occurs

What environmental variables evoke and maintain target behavior

Treatment is subsequently developed around manipulating environmental variables hypothesized to maintain target behavior
Functional assessments offer

A) Parsimonious explanation of behavioral pathology that emphasizes role of environment in maintaining and exacerbating target behavior

B) Development of an effective intervention to suppress target behavior while increasing replacement behaviors

Sturmy (2007)
Indirect assessments

• Gambling Functional Assessment (Dixon & Johnson, 2007; Dixon, Wilson, & Schrieber, under review)

• Gambling Functional Assessment-Revised (Weatherly, Miller, & Terrell, 2011)

Limited convergent validity (Lerman & Iwata, 1993; Mace & Lalli, 1991)

• 43.8-56.3% (Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2001)

• Yet to be assessed with gambling assessments
Gambling Functional Assessment

Gambling Functional Assessment
Answer the questions below using the provided scale. Write the corresponding number next to each question.

<table>
<thead>
<tr>
<th>Never</th>
<th>Almost Never</th>
<th>Seldom</th>
<th>Half the Time</th>
<th>Usually</th>
<th>Almost Always</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

1. I tend to gamble most frequently when there is nothing else going on or I have nothing better to do. __1__
2. I really enjoy the complementary perks that come along with gambling, like free points, drinks, comp coupons, etc. __5__
3. I enjoy the social aspects of gambling such as being with my friends or being around other people who are having a good time and cheering me on. __3__
4. I often gamble after fighting with my spouse or significant other. __0__
5. I feel more alive when I am gambling than when I am doing other types of activities. __2__
6. Even if I lose, I can always count on a friend/loved one to help me through this difficult time. __1__
7. I often gamble when I feel stressed or anxious. __4__
8. After I gamble, I like to go out and celebrate my winnings with others. __1__
9. When I gamble, I like to accumulate points at a casino so they will offer me incentives and bonuses. __5__
10. I like the sounds, the lights, and the excitement that often go along with gambling. __2__
11. I gamble to get a break from work or other difficult tasks. __1__
12. If it were not for the ability to win a bunch of money, I would probably not gamble much at all. __5__
13. I only gamble when my friends are gambling with me. __4__
14. I often gamble when I am feeling depressed or sad. __2__
15. I find myself feeling a rush, and getting excited when I gamble. __4__
16. After I gamble, I often find comfort from other people to help me deal with my losses. __2__
17. If I have a hard day at work, I am likely to gamble. __1__
18. I gamble more often when I have been offered complementary drinks, hotel rooms or other items. __5__
19. When I gamble, I am often unaware of my surroundings. __1__
20. I gamble primarily for the money that I can win. __5__
Gambling Functional Assessment- Revised

Weatherly et al. (2011). Behavior Modification

**GFA – R**

Please answer each question with the appropriate number from the following scale:

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<tr>
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<th>Usually</th>
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1. After I gamble, I like to go out and celebrate my winnings with others.
2. I gamble after fighting with my friends, spouse, or significant other.
3. I gamble when I feel stressed or anxious.
4. I like the sounds, the lights, and the excitement that often go along with gambling.
5. If I have a hard day at work or school, I am likely to gamble.
6. I gamble when my friends are gambling with me.
7. I find myself feeling a rush, and getting excited, when I gamble.
8. When I gamble, I choose which games to play based upon my best chance of winning.
9. I gamble to get a break from work or other difficult tasks.
10. I gamble when I am feeling depressed or sad.
11. I find that gambling is a good way to keep my mind off of problems I have in other parts of my life.
12. I gamble when I am in debt or need money.
13. I really enjoy the complementary perks that come along with gambling, like free points, drinks, comp coupons, etc.
14. I enjoy the social aspects of gambling such as being with my friends or being around other people who are having a good time and cheering me on.
15. I gamble when I have a work project or class assignment that is due in the near future.
16. I gamble primarily for the money that I can win.

Maintaining Variable
Gambling Functional Assessment


- 20 item self-report questionnaire
- Identifies the degree of intensity of each of the four functions for behavior have in sustaining gambling
- Likert Scale 0-5
- Takes 5 min or less to administer
- Higher scores usually occur on 1 of the 4 functions
- Total score potential indicator of severity

### Gambling Functional Assessment

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20. I gamble primarily for the money that I can win. ____
Recap

• Results from the exploratory analysis suggested the GFA accounted for 64.25% of total variance across four factors.

• Broadening categories of reinforcer class of *positive* reinforcer (i.e. attention, tangible, sensory)

• Implications for gambling subgroups?
  – How can the GFA inform us of different types of gamblers?
Wilson & Dixon (under review)

• Purpose: to identify brain activation differences across gambling subtypes

• Participants
  – 35 gamblers (M age = 22.8, SD= 8.95 years)
  – 83% male
  – Criterion for inclusion
    • SOGS >3 (M SOGS = 7.5, SD= 3.4)
    • Top score on highest maintaining function = 1 standard deviation from other components

▪ General Procedure
  ▪ Community Hospital in United States
  ▪ fMRI sans acquired on 1.5 T magnet
  ▪ Slot machine activity and subjective responses programmed on E-Prime 1.0 software
  ▪ 2 (group) x 3 (condition) mixed group design was used to assess brain activation differences
• Scanning Procedure
  – 30min slot machine activity
  – Wheel images were presented to give the illusion of spinning wheels
  – Each wheel spin stopped on one of three equally likely outcomes:

How close is this to a win?

1
Not at all Close

3
Somewhat Close

5
Extremely Close
WINING OUTCOMES

NEAR MISS OUTCOMES

LOSS OUTCOMES

25s Spin

2.5s Display

2.5s Likert Response

2.5s ITI
Recap

- **Taken together with previous research...**
  - Unique brain activation patterns depending on slot machine outcome
  - No difference in behavioral responding across Subtypes of gamblers
  - Difference in brain activation across subtypes

- **Implications for treatment**
  - How does this impact clinical interventions?
  - Construct validity of GFA?
Establishing a Methodology to Assess Convergent Validity of Functional Assessments

- 4 traditional conditions
- Control included for experimental control
Experimental Setting: High Internal Validity

• N = 20
  – Recreational sample (M SOGS = .4; range = 0-3)
    • M age = 35.55 (SD= 11.44)
    • 90% female, 90% Caucasian, 40% Bachelor’s degree, 70% reported debt status, 90% gambled at least once while 45% prefer slot machines

• Settings and Apparatus
  – Small office space/SLU Gambling Lab
  – Computers equipped with Visual Basic
  – Demographic survey, SOGS, GFA, GFA-R
  – Punisher assessment
Methods

• Dependent Measures
  – Latency between responses
  – Inter-Trial-Interval during reinforcement delivery
  – Convergent validity between the GFA, GFA-R, and the experimental functional analysis

• Experimental Design and Analyses
  – Multi-element single-subject design
  – Correlation/regression
    • SOGS, GFA/GFA-R, gambling behavior
  – One-way analysis of variance
    • Test differences in rates of play across machines
    • Bonferroni post-hoc analysis
      – Identifies which group means significantly differ
Procedure

- **Completion of Assessments**
  - Demographic Information
  - South Oaks Gambling Screen
  - Indirect assessments (i.e. GFA and GFA-R)
  - Aversive assessment

- **Experimental Functional Analysis**
  - Analog conditions (i.e. attention, escape, access to tangibles, sensory, and control)
  - Random-ratio schedule with 5 s access to reinforcement or escape from aversive stimuli during analog conditions
Average Inter-trial Interval

Red = attention, Orange = Tangible, Yellow = Sensory, Blue = Escape, Green = Control
Average Inter-trial Interval
Average Inter-trial Interval

EFA-19

EFA-17
• What was your favorite machine?

- SENSORY
- TANGIBLE
- ESCAPE
- ATTENTION
- CONTROL

Results Cont.
Table 10. Convergent validity of indirect assessments, and most-preferred machine.
Interpretation

• Results of the one-way ANOVA
  – No distinct differences in rates of play
    • On aggregate

• Visual Analyses suggests that idiosyncratic variables contribute to differences in rate of play

• For those that preferred the sensory machine
  – Attention machine was played slower than all others
Experimental Setting: High External Validity

- 5 reel 20 line Slot machines off casino floor
- Each associated with a different outcome
- Random ratio reinforcement schedule across each machine
Conditions

Forced Choice
• Required to play two minutes on each machine
• Consequences

Free Play
• 10-mins of gambling time

Vignettes
• 2-mins of play per trial
<table>
<thead>
<tr>
<th>Type of Motivating Operation</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Imagine the last time you received a thank you note</td>
</tr>
<tr>
<td>Sensory Stimulation</td>
<td>Imagine the last time you experienced a rush while gambling</td>
</tr>
<tr>
<td>Avoidance</td>
<td>Imagine the last time you needed a break from difficult tasks</td>
</tr>
<tr>
<td>Access to Tangibles</td>
<td>Imagine the last time you won a jackpot while gambling</td>
</tr>
<tr>
<td>Attention</td>
<td>Imagine the last time you enjoyed the social aspects of gambling</td>
</tr>
</tbody>
</table>
Experiment 2

\[ n = 31 \]

Mean (SD) age
- \( 32.55 (13.07) \)

South Oaks Gambling Screen (SOGS)
- \( 2.37 (0-13) \)

Distribution of Ethnicity
- African American: 19.35%
- Caucasian: 67.74%
- Indian: 3.23%
- No response: 9.68%

87.1% had gambling experience
Methods

• Dependent Measures
  – Machine selected
  – Amount Bet
  – Magnitude of win
  – Latency of selection

• Experimental Design and Analyses
  – Multi-element single-subject design
  – Correlation/regression
    • SOGS, GFA/GFA-R, gambling behavior
  – One-way analysis of variance
    • Test differences in rates of play across machines
    • Bonferroni post-hoc analysis
      – Identifies which group means significantly differ
Convergent Validity

• Calculated for every indication
  • GFA – Tangible/Attention
  • Analogue – Tangible
  • 50%
Convergent Validity

![Bar chart showing the percent sample for Match, Partial, and No Match categories for GFA and GFA-R. The chart indicates a higher percentage of Match for GFA-R compared to GFA.](chart_image)
Interpretation

• Higher rates of play on the tangible machine
  – Suggests that contingent win sounds, and bonus points were motivating
• Correlated conditions
  – Suggests that contingencies are equivalent throughout study.
Interpretation cont.

• Regression of indirect assessments and SOGS
  – Negative reinforcement relates to greater SOGS score
    • For every 1 point increase on GFA Escape/Avoidance
      – .53 increase in SOGS score
    • For every 1 point increase on GFA-R Negative
      – .34 increase in SOGS score
On Vignettes

• Tangible related vignettes
  – Higher rates of matches to the tangible machine
    • May be because most participants chose the tangible machine
      – Still greater miss matches than matches

• All other vignettes
  – Significantly greater rates of mismatches than matches
Figure 1 (above).
Weekly self-report thought scales for Participant 1. Non-function based intervention (NFBT)

Figure 2 (above).
Weekly self-report thought scale for Participant 2. Function based intervention (FBT)
Figure 3 (above).
Weekly self-report thought scale for Participant 3. Function based intervention (FBT)
Subjective Slot machine ratings

![Graph showing subjective slot machine ratings for different groups.](image-url)
Discussion

Can complete a functional analysis within two hours

Differentiation observed in most participants
  • Indicating a functional relationship

  – Imperative that we identify effective and efficient way to identify function of gambling behaviors, in order to provide functional interventions
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• Dr. Mark Dixon (Southern Illinois University)
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