

Changes in Goal-Directed Behavior on an Effort Expenditure Task as a Predictor of Anhedonia Symptom Improvement



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Introduction

Anhedonia refers to a loss of interest and pleasure, especially in activities one previously enjoyed (Serretti, 2023). Anhedonia is a common symptom of **Major Depressive Disorder (MDD)** (Hasler et al., 2004), making it difficult for individuals to feel motivated to complete daily expected tasks. 70% of people with depression have reported anhedonia, and have struggled with daily tasks as a consequence (Serretti, 2023). Anhedonia is one of the biggest contributors to the overall burden of depression, as it correlates with increased psychosocial impairment, suicidal ideation, comorbidity, and stress (Whitton et al., 2023). It is a pressing issue as depression has become increasingly more prevalent in recent populations. My prospective project will look further into anhedonia symptom improvement and contribute to treatment research. It aims to answer the question of whether anhedonia symptom improvement can be predicted by participant changes in goal-directed behavior on an effort expenditure task.

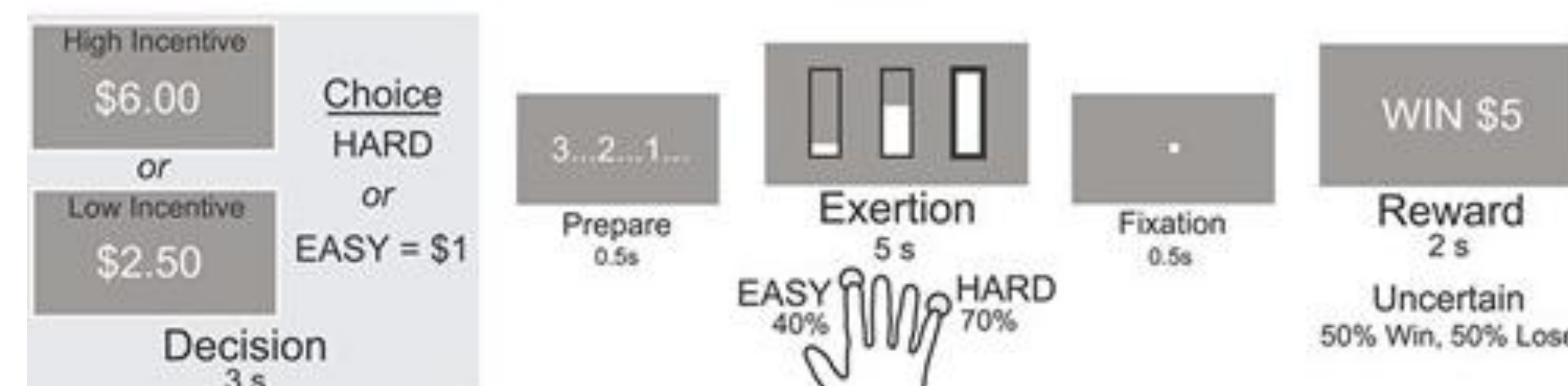
Goal-Directed Behavior and Hypothesis

Goal-directed behavior is the willingness to exert effort in order to reach a certain goal, which in this project involves earning a fictional monetary reward. For my primary analysis, I hypothesize that goal-directed behavior change will correlate with anhedonia symptom change. Specifically, that participants whose effort expenditure increases across the three measured sessions will experience an improvement of anhedonia symptoms, indicated by significant decreases in SHAPS and DARS scores. For my secondary analysis, I hypothesize that non-responders will not have changes in goal-directed behavior across the study. The null hypothesis states that regardless of change in goal-directed behavior, there will be no relationship found with symptom improvement.

Methods

My sample will consist of a small number of participants (estimated N=15) from an ongoing study involving a 5-day brain stimulation treatment paradigm using transcranial alternating current stimulation (tACS). Depressive symptoms are assessed by the **Snaith-Hamilton Pleasure Scale (SHAPS)** and **Patient Health Questionnaire Depression Scale (PHQ-8)**. Participants are eligible if they score at least a 33 on the SHAPS and 8 on the PHQ-8. Anhedonia symptoms are assessed using the **Dimensional Anhedonia Rating Scale (DARS)** and SHAPS. I will compare symptom severity and behavioral data from a MATLAB task across the first and final stimulation sessions, and the 2-week follow-up.

Streamlined Effort Expenditure for Reward Task (SEEfRT)



SEEfRT, based on the original EEfRT task (Treadway et al., 2009), measures how participants make decisions when they are presented with different levels of physical effort and reward. Participants place their right hand on a keyboard in the home-row position and fill up a bar on the screen quickly. Using the index finger on “J” is the “EASY” task, while using the pinky finger on “;” is the “HARD” task. A 5-pound weight is placed on participants’ wrists to ensure only finger muscles are used. Fictional monetary values, ranging from \$2.50 to \$6, are presented before participants decide on difficulty level. Upon completion of the task, there is a 50% chance that they will get nothing and a 50% chance that they will get the reward they selected (\$1 for EASY and variable for HARD). Upon failing the task, they earn nothing. Behavioral decision data from this task on MATLAB will allow us to measure goal-directed behavior as the percentage of trials for which participants choose HARD.

SHAPS and DARS

SHAPS: 14-item scale directly assessing anhedonia with questions about social interaction, sensory experiences, and interests (Snaith et al., 1995).

Rated on a 4-point Likert scale: 0 = Strongly Disagree, 1 = Disagree, 2 = Agree, 3 = Strongly Agree, or reverse-coded

DARS: 17-item scale assessing severity and the extent one has experienced a loss of pleasure in 4 categories: hobbies, food/drinks, social activities, and sensory experiences (Rizvi et al., 2015).

Rated on a 5-point Likert scale: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Mostly, 4 = Very Much

Data Analysis Plan and Expected Results

For my primary analysis, I will use a Pearson’s Correlation test to determine the relationship between change in both goal-directed behavior and symptom severity across sessions. For my secondary analysis, I will compare the differences in goal-directed behavior across sessions between responders and non-responders using a student’s t-test. These analyses will be run through MATLAB. Upon attaining a significant result, I expect that an increase in goal-directed behavior will correlate with a decrease in symptom severity. If my alternate hypothesis is correct, this would be displayed as a negative correlation between variables. If the null hypothesis is true, no relationship will be shown.

References

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