

# REWARD PROCESSING IN INDIVIDUALS WITH AUTISM



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# Background and Goals

- The reward system functions by releasing dopamine in certain areas of the brain, which stimulates a feeling of reward when certain actions are performed in certain situations (for instance, this system is activated if we eat when we are hungry). This motivates us to repeat these actions in similar situations.
- Previous imaging studies have shown dysfunction in reward circuitry in people with Autism Spectrum Disorders (ASD) compared to Typically Developing (TD) individuals, particularly when provided with socially rewarding stimuli.
- Dysfunction in reward circuitry is also thought to be linked to two core symptoms of ASD, restricted repetitive behaviors and social deficits.
- The goal of this study is to explore the functional output of the reward system in individuals with ASD compared to TD individuals. This information may be used to develop better therapies for individuals with autism.
- In order to characterize functional output of reward circuitry in terms of “wanting” of reward, we used the Effort Expenditure for Reward Task (EEfRT). This task was designed to measure how much effort participants are willing to give in order to obtain a monetary reward. Originally, this task was designed to be a functional measure of anhedonia and useful for looking at depression symptoms. However, because anhedonia can also be linked to reward system activity, we can use this task to obtain a measure of functional output of the reward system.
  - In this task, participants were given the choice of completing an easy task for \$1, or completing a difficult task for a reward varying from \$1.24-\$4.12. This was repeated over many trials.
  - Participants did not receive money just for completing the task, but were informed before each trial of the probability that they would receive money if they completed their chosen task on that trial. The probabilities were either 12%, 50%, or 88%.

# Results

	Control (n=40)			ASD (n=19)				
Probability	Mean	SD	Range	Mean	SD	Range	t	P
12%	19.7	20.4	0-64.7	44.9	36.3	0-100	-2.822	.010
50%	51.1	26.8	0-87.5	59.2	31.3	6.3-100	-1.029	.308
88%	67.4	22.5	23.5-100	78.6	25.7	17.7-100	-1.719	.091

	Control (n=40)			ASD (n=19)				
Size	Mean	SD	Range	Mean	SD	Range	t	P
Small	19.6	17.8	0-57.1	42.9	31.2	0-100	-3.017	.006
Medium	45.2	26.6	0-86.7	60.7	32.3	6.7-100	-1.954	.056
Large	64.0	23.5	19-100	73.2	27.2	19-100	-1.328	.189

Across all probability levels, we found that individuals with ASD chose the hard task more often than TD individuals,  $t(57)=2.37$ ,  $p=.02$ . However, we found the overall differences were due to individuals with ASD choosing the hard task more often in situations where there is a low probability of winning the task. A 3x2 ANOVA showed that there were significant differences between the two groups  $F(2, 56)=3.36$ ,  $p=.04$ . However, post hoc t-tests revealed that there were only significant differences at the  $p=.05$  level between the two groups at the 12% probability level, suggesting that the group differences diminished when there was a greater chance of winning.

Across all reward sizes, we found that the differences between the ASD group and the TD group based on reward size were approached statistical significance  $F(2, 56)=2.93$ ,  $p=.06$ . However, post hoc t-tests revealed that there were differences between the TD and the ASD groups for small rewards  $t(57)=-3.017$ ,  $p=.006$ .