The Effect of Disrupted Insulin Signaling on Impulsive Choice

Jesseca R. A. Pirkle *, Catherine C. Steele, Brynn T. Critcher, & Kimberly Kirkpatrick
Department of Psychological Sciences | Kansas State University

Introduction

- Type 2 diabetes results when the body’s insulin signaling is disrupted. Following early diagnosis, Type 2 diabetes can be reversed with adequate exercise and improved diet.
- Despite the fact that Type 2 diabetes can be reversed, the prevalence of the disease continues to increase annually. 1
- Impulsive choice, or one’s willingness to wait for a reward, is associated with binge eating and obesity. This could explain why it is difficult to make the necessary lifestyle changes to reverse the disease. 2,3
- Furthermore, recent studies have found that disrupted insulin signaling is associated with impulsive choice.4
- The current study aimed to understand the relationship between disrupted insulin signaling and impulsive choice.

Methods

Subjects: 24 Male Sprague Dawley rats
Groups:
• Saline
• Insulin Receptor Antagonist (S961)
Surgery: An osmotic mini pump was implanted subcutaneously. This allowed for each solution to be delivered at a constant rate of 2.5μL/hr for 23 days
Impulsive choice task: After 7 days of exposure to the solutions, rats underwent an impulsive choice task

Results

<table>
<thead>
<tr>
<th>Blood sample (day 0)</th>
<th>Osmotic Pump implantation</th>
<th>Food restricted (day 7)</th>
<th>Blood sample (day 7)</th>
<th>Impulsive choice task</th>
<th>Blood sample (day 23)</th>
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Fasting insulin levels decreased on Day 7 and then partially rebounded by Day 23, and there were no group differences.

Discussion

- Fasting blood insulin levels did not differ from the control group after exposure to the antagonist.
- It is possible that food restriction (on Day 5) could have counteracted the antagonist by increasing insulin sensitivity.5
- While there were no group differences in fasting insulin levels, blocking insulin receptors increased sensitivity to delay and induced a preference for a larger reward.
- The alteration in sensitivity to delay is a key marker for delay discounting, or the process by which rewards decrease in value as the delay to the reward increases.6
- Because delay discounting is associated with binge eating and obesity, individuals with disrupted insulin signaling may not be able to change their lifestyle to reverse the disease.3
- Future work should investigate the source of the increased preferences for the larger reward.
- Behavioral interventions should target sensitivity to delay to increase the subjective value of delayed rewards for individuals with disrupted insulin signaling.

References


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* Email: jesspirkle@ksu.edu