

Software to Measure Consumer Preferences in the Treatment of Depression

by Nick Jang

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Introduction

Function: The purpose of the project is to create a ranked list of treatments that a patient would most prefer.

Problem: Patients with depression are being prescribed inefficient treatments. Patients who play no part in the prescription of their treatments often change treatments or add another treatment. Also, patients who do not know all the treatments, cannot accurately suggest medications they prefer.

Solution: A software that finds out what patients prefer and suggests treatments accordingly. We can reliably determine a patient's preferences and suggest treatments using methods called Best Worst Scaling, Accelerated Spectral Ranking, and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS).

Step 0: Depression Treatments

This is what we are working with. There are 18 common side effects:

Headaches	Effects blood pressure
A sexual problem	Seizures
Feeling tired	Overdose affects heart
Weight gain	Meeting regularly
Nausea	Having homework
Diarrhea	Sharing personal details
Dry Mouth	Works quickly
Constipation	Helps sleep problems
Blurred vision	Ends after several months

References

1. Flynn, T.N., and A.A.J Marley. "Best-Worst Scaling: Theory and Methods." Handbook of Choice Modelling: 1-29.
2. Agarwal, Arpit, Shivani Agarwal, and Prathamesh Patil. Accelerated Spectral Ranking. 2018.
3. Wong, Rong-Tsu. Performance Evaluation Method - Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). PPT.

Software

Step 1: Best Worst Scaling (BWS)

BWS is a **method of asking survey questions** to get a ranked list from the participant^[1]. Each question **contains four items**, and every item appears in a question at least three times. The patient **picks the best and worst** items (side effects).

Trivial Example:

A, B, C, D | B chosen best, C chosen worst

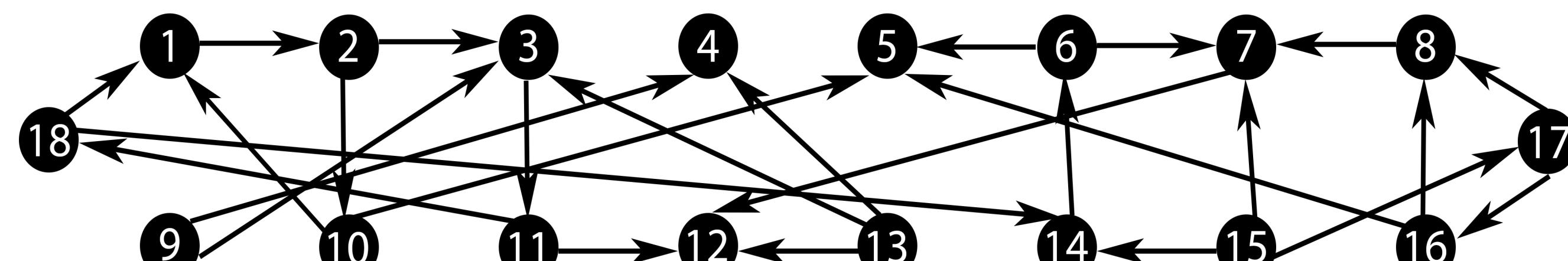
Conclude: B > A & D > C

Best	Side Effect	Worst
✓	Headaches	
	A sexual problem	
	Moderate weight gain	
	Nausea	✓

An example of Best Worst Scaling survey format.

Step 2: Accelerated Spectral Ranking (ASR)

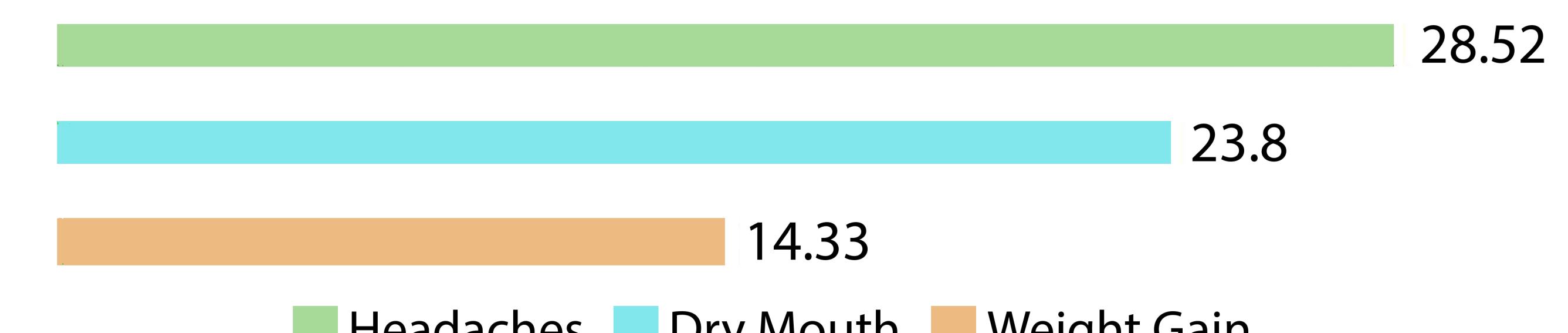
ASR takes the comparisons we collected from the BWS survey and **creates a partially ranked list** of the side effects. This method works with limited data from our short and easy survey.



Our 18 side effects and BWS comparisons form a Markov chain.

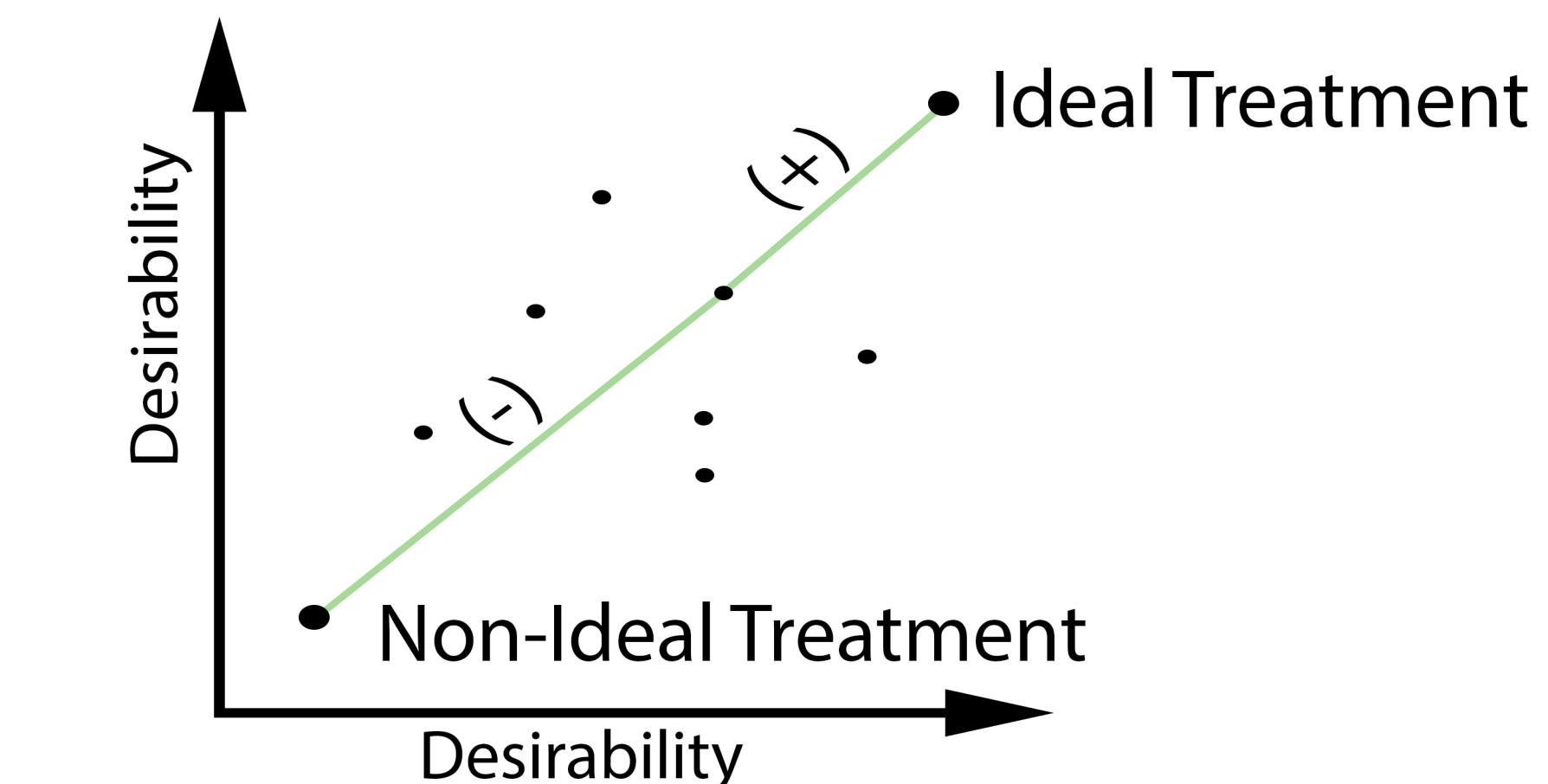
ASR uses the chain to score each side effect^[2].

An example of top three scores from ASR (score is out of 100):



Conclusion

BWS has been the best method for asking survey questions. Question formats that depend on number scales are not as informative because we end up with more duplicate rankings. Having four items to a question makes things easier on the patient. ASR turns out to be the best method for analyzing the BWS data. It gives similar results as a paid software currently being used. Testing with even fewer questions might be useful. TOPSIS effectively converts preferences to desired treatments. No change needed there.



Future Plans

1. Use to treat more than depression.
2. Create the UI, so it can be used.
3. Easily allow hospitals to create their own surveys. It could be useful to anyone who wants to suggest things based on a set of preferences.