Neuroscientific explanation of addiction

Introduction

Addiction, also known as substance use disorder (SUD), is the number one public health crisis in the US, responsible for 35% of all deaths each year. Approximately 85% of incarcerated prisoners are in jail for drugs or crimes related to drugs. Over 90% of children in the foster care system have experienced a family history of substance abuse and almost half of them report having abused substances in the past six months. SUD impacts homelessness, food insecurity, domestic violence, and almost every major social problem in the country.

Perhaps the biggest factor preventing people suffering with SUD from getting treatment is social stigma. The vast majority of those that relapse within 90 days of leaving treatment report a lack of social support and high perceptions of stigma and social distancing. Most people view SUD as a moral character flaw and lack of willpower, even though science has shown that there exist biological factors preventing people from overcoming addiction without medical help. Explanations of bio-genetic factors affecting addiction, while generating empathy for those with SUD, also increase stigma and social distancing, making relapse more likely. Recent neuroscientific explanations affecting addiction remain largely untested.

In this assignment, we will use Amazon Mechanical Turk (AMT) to conduct a social experiment to assess the impact of neuroscience explanations for addiction compared with bio-genetic explanations. Our hypothesis is that a neuroscientific explanation of addiction will achieve the same benefits of empathy and reduced moral bias as bio-genetic explanations, but without the same level of social distancing and lack of perceived social support.

Procedure

You will conduct and AMT experiment involving two conditions. Condition A will involve presenting a bio-genetic explanation of addiction that AMT workers will read and then asking them to answer questions from validated scales designed to measure stigma. Condition B will involve presenting a neuroscientific explanation of addiction and asking AMT works to answer the same questions. We will statistically test whether there is a significant difference in stigma.

Condition A - The bio-genetic explanation follows:

Addiction, also known as substance abuse disorder, is a disease that affects 10-15% of the US population. Scientific research has shown that genetic factors can affect how people respond to addictive substances. These genetic differences can influence how the body processes drugs or alcohol, affecting an individual's tolerance and risk of addiction. Genetic variations can also impact how a person experiences pleasure and reinforcement from addictive substances or behaviors, contributing to the development of addiction. Genetic predispositions to mental health disorders can increase the risk of addiction. These conditions may share genetic underpinnings with addictive behaviors. Environmental factors, such as exposure to substances or stressful life events, can interact with genetic makeup to influence addiction risk. Rather than treating those suffering from substance abuse disorder as people with poor moral character or lack of will power, we need to understand they have a disease and help them find proper care.

Condition B - The neuroscientific explanation follows:

Addiction, also known as substance abuse disorder, is a disease that affects 10-15% of the US population. Scientific research has shown that chronic exposure to addictive substances causes damage to the brain. Addictive substances or behaviors lead to a surge in dopamine (the motivation hormone) and affects the brain's reward pathway. The brain adapts to repeated dopamine spikes by dropping receptors and tolerance develops. Individuals then require more of the substance or behavior to function normally. Without the substance, they experience withdrawal symptoms and possible death. The brain associates cues or triggers in the environment with the rewarding experience of addiction. This creates intense cravings that drive compulsive behaviors, making it difficult for individuals to control their actions and quit. Rather than treating those suffering from substance abuse disorder as people with poor moral character or lack of will power, we need to understand they have a disease and help them find proper care.

Following the explanation (either condition A or B) AMT workers will be presented with the following question (Bogardus, 1926):

Please give me your first reaction, yes or no, whether you personally would feel comfortable having someone who was recently (within the last month) discharged from an addiction treatment facility:

- *Marrying your son/daughter, sibling or other close relative? (score 1.00)*
- *As a close friend (2.00)*
- *As neighbors on the same street (3.00)*
- *As co-workers in the same occupation (4.00)*
- *As a registered voter in my city/county (5.00)*
- *As a visitor in my county (6.00)*
- *Would exclude from entry into my city/county (7.00)*

Next ask the AMT worker to answer the following questions (Perceived Dangerousness of Addicts Items {Response format 0 = strongly agree, 1 = agree, 2 = not sure but probably agree, 3 = not sure but probably disagree, 4 = disagree, 5 = strongly disagree})

1. If a group of former addicts lived nearby, I would not allow my children to walk to school alone. (Reversed Scoring)
2. If a former addict applied for a teaching position at a grade school and was qualified for the job I would recommend hiring him or her.
3. One important thing about addicts is that you cannot tell what they will do from one minute to the next. (Reversed Scoring)
4. If I know a person has been an addict, I will be less likely to trust him. (Reversed Scoring)
5. Following failed attempt at rehap, should addicts go to jail to protect the public from addicts. (Reversed Scoring)
6. If a former addict lived nearby I would not hesitate to allow young children under my care to play on the sidewalk.
7. Although some addicts may seem all right it is dangerous to forget for a moment that they have the potential to relapse. (Reversed Scoring)

Next, ask the AMT worker to respond to the following vignette:

Here is a description of a 27-year-old man, let's call him Jim Johnson. Several years ago, he developed an opioid addiction following an injury that progressed to regular heroin use. He completed treatment and appears to be recovered and is doing pretty well.

Jim works at a job in a local business. He earns $54,000 a year before taxes and is doing well enough. He is well groomed and known for dressing neatly.

At his job, he gets along well with his co-workers and is on friendly terms with them. He begins his days chatting briefly with the people he works with and then gets down to business. He takes coffee and lunch breaks during the day, just like everyone else, and returns to work when his coworkers do.

Every once in a while Jim becomes frustrated with all the demands at work and says he feels anxious about them. Once when he felt this way, he got red in the face, went to a back room, and began pacing and complaining to a co-worker in an angry tone of voice. Later, he talked to some of the people he works with about the pressures he is sometimes under.

Jim is interested in meeting and dating young women in the community. He is considering joining a local church group to meet them. He is also looking for a job that gives him more responsibility and pays better than his current one.

AMT workers will then answer the following questions about Jim (Link et al, 1987):
Social Distance Items { Response format was 0 = definitely willing, 1 = probably willing, 2 = probably unwilling, 3= definitely unwilling}

1. How would you feel about renting a room in your home to someone like Jim Johnson?
2. How about as a worker on the same job as someone like Jim Johnson?
3. How would you feel having someone like Jim Johnson as a neighbor?
4. How about as the caretaker of your children for a couple of hours?
5. How about having your children marry someone like Jim Johnson?
6. How would you feel about introducing Jim Johnson to a young woman you are friendly with?
7. How would you feel about recommending someone like Jim Johnson for a job working for a friend of yours?
8. There should be a law forbidding a former addict the right to obtain a weapons permit. (Reversed Scoring)

Analysis

1. You will construct several scales from the data collected from your AMT workers. The first scale is the Bogardus Social distance scale. Each worker will be scored with a number as indicated above and you will conduct a two-sample T-test to evaluate whether there is a statistically significant difference between conditions A and B.
2. You will construct a perceived dangerousness scale using the above questions. First you will test internal consistency using Cronbach's alpha and report the value. Then you will average the numeric response for each worker. Finally, conduct a two-sample T-test to evaluate whether there is a statistically significant difference between conditions A and B.
3. You will construct a social distance scale using the Jim Johnson vignette and corresponding questions. Test internal consistency using Cronbach's alpha and report the

value. Then, average the numeric response for each worker. Conduct a two-sample T-test to evaluate whether there is a statistically significant difference between conditions A and B.

4. Report the correlation across these three variables for each condition.
5. Provide brief comments on anything interesting you learned from using AMT for this assignment.

For your assignment, turn in a document with your response to the five analysis tasks above, your raw data from AMT workers, and your script for analysis.

Helpful Tips

You may use any tool of your choice for collecting the data above. You may even choose to augment data collection manually (not using AMT), but you must collect some responses with the AMT platform.

I recommend the use of Qualtrics free version (https://www.qualtrics.com/support/survey-platform/managing-your-account/trial-accounts/) which should provide sufficient functionality to complete the assignment. I don't provide a tutorial on this, because I feel that Qualtrics' resources are better than anything I can provide.

Here are some helpful R Code snippets for analyzing the data:

```
library('psych') #this is the library for analyzing itemized scales

#this is a command for loading a *.csv file
my.data <- read.csv("data.csv",
                    sep = ",",
                    header = TRUE)

#this is a function for converting text response to numeric response for analysis
convLikert <- function(x){
ifelse(x=="Strongly Agree", 4,
     ifelse(x=="Agree", 3,
          ifelse(x=="Neither Agree nor Disagree", 2,
               ifelse(x=="Disagree", 1,
                    ifelse(x=="Strongly Disagree", 0,NA)))))
}

#example using the Likert conversion function above
Q2_1 <- convLikert(my.data$Q2_1[2:256])

#example using the scoreItems command.  The -1 are for reverse-coded questions.
Q4 <- scoreItems(c(-1,1,-1,1,1,1,-1,1,1,1), (Q4_c[,1:10]), totals = FALSE)

Use summary(Q4) or Q4$alpha to report the Cronbach's Alpha for internal consistency.

Seek additional help with ??scoreItems in the R Studio command window.
```