# Final Project: The Relationship between Sleep, Depression, Quality of Life, and Socioeconomic Status

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Author Note

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Abstract

Depression is a widespread and debilitating mental illness. However, sleep quality is a potent and modifiable protective factor that may reduce depressive symptoms and increase quality of life. In this study, we examined the associations among depressive symptoms, sleep quality, and quality of life in a high risk sample. First, we assessed if there are differences in depressive symptoms, sleep quality, and quality of life according to socioeconomic status. Using correlational analyses, we found depressive symptoms were negatively correlated with quality of life and sleep quality. Meanwhile, sleep quality was positively correlated with quality of life. The results indicate that intricate and strong associations exist among depressive symptoms, sleep quality, and quality of life. Clinical implications of these findings are also discussed.

*Keywords:* sleep, depression, quality of life, SES

Word count: X

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## Introduction

Sleep quality, typically indexed by a combination of sleep efficiency and total sleep time (TST), is an important outcome in the context of long-term health. Sleep efficiency is defined as the percentage of time spent sleeping while laying in bed, whereas, total sleep time is the amount of time spent sleeping, accounting for factors such as sleep onset latency and awakenings. There is a multitude of studies that suggesat that poor sleep is a prospective risk factor in premature mortality (Knutson, Spiegel, Penev, & Van Cauter, 2007). More specifically, chronically disrupted and limited sleep has been linked to increased rates of obesity, diabetes, cardiovascular disease, cognitive impairment, and mental health disorders (Gangwisch, Malaspina, Boden-Albala, & Heymsfield, 2005).

Additionally, recent epidemiological research suggests that sleep has continued to decrease over the past 30 years, which is consistent with the significant increase in sleep-related complaints in the workforce (Ferrie, Kumari, Salo, Singh-Manoux, & Kivimäki, 2011). In this review by Ferrie and colleagues, the reduction in sleep quality is also thought to be associated with the staggering increase in work-related and vehicular accidents. While research has provided evidence between sleep quality and health-outcomes, there are few studies examining other global measures such as quality of life.

Quality of life is a helpful and comprehensive measure of an individual's subjective experience. For example, this variable may encompass interpersonal and familial relationships, occupational satisfaction, financial security, and intellectual development. While there may be tangible health-related outcomes (e.g., number of hospital visits), the subjective interpretation of distressing impairments due to poor sleep quality may also provide valuable insights. This overall outcome can adequately capture subthreshold depressive symptoms, which may still benefit from various interventions (e.g., cognitive-behavioral therapy for insomnia).

While this global measure may capture the negative impact of poor sleep quality through broad strokes, depression is a more clinically-specific outcome to consider. Depressive symptoms, such as low mood and irritability, have been consistently linked to sleep-related psychopathology (Spoormaker & Bout, 2005). This pattern of poor sleep quality may increase obstacles associated with obtaining reliable treatment by exacerbating current depressive symptoms. Therefore, sleep quality seems to be at the root of these domain-spanning impairments and an essential target for intervention.

In this present study, we set out to evaluate evidence for the association between sleep quality, depression, and quality of life in a sample of diverse sample of adults. These relationships will also be investigated in the context of low, medium, and high SES as a moderator, as those in lower socioeconomic groups are at a higher risk for depression and sleep problems. Given the importance of sleep quality and mental health on long-term health outcomes, we hope to enrich the current literature with a better understanding of these complex factors. Findings from this study will inform models of psychopathology and provide a foundation from which causal and longitudinal intervention-focused research can be constructed.

## Methods[1]

### Participants

Participants were recruited through Amazon Mechanical Turk (MTurk). MTurk is a survey tool offered through Amazon.com, where people around the world can complete surveys for monetary compensation. MTurk is commonly used in social science research studies, and it has been found to be representative.

In total, 500 participants were included in this study, all of whom had complete data. Out of 500 participants, 194 identified as “low” SES, 244 identified as “middle” SES, and 62 identified as “high” SES. Out of 500 participants, 64 had not graduated high school, 157

[1] This is a fictional Methods section, as we simulated our data. However, this is a realistic way that we could go about collecting this data in the future

completed high school, 96 had a postsecondary certificate, and 183 had some postsecondary education. Additionally, 344 identified as European-American, 51 identified as African American, 51 identified as Hispanic, 27 identified as Asian-American, 15 identified as American Indian/Alaskan Native, 11 identified as Pacific Islander, and 1 identified as "other."

## Materials

**Depressive Symptoms Scale.** A scale to measure depressive symptoms was created by the researchers for the purposes of this study. Participants were instructed to rate each item on Likert-type scale, where 1 corresponds to "strongly disagree," and 5 corresponds to "strongly agree." The scale consisted of three items, including: "Over the last 2 weeks, I have felt little interest or pleasure in doing things;" "Over the last 2 weeks, I have felt down, depressed, or hopeless;" and "Over the last 2 weeks, I have felt tired or had little energy." Scale items were summed to create a depression score, where higher scores represent higher depressive symptoms.

**Quality of Life Scale.** A scale to measure participants' quality of life was created by the researchers. Participants were instructed to rate each item on Likert-type scale, where 1 corresponds to "strongly disagree," and 5 corresponds to "strongly agree." The scale consisted of four items, including: "My life is ideal;" "I am satisfied with my life;" "So far I have been able get the important things I want from life;" and "I have accomplished many of the things in my life." Scale items were summed to create a total quality of life score, where higher scores represent better quality of life.

**Sleep Quality Scale.** A scale to measure participants' sleep quality was created by the researchers. Participants were instructed to rate each item on Likert-type scale, where 1 corresponds to "strongly disagree," and 5 corresponds to "strongly agree." The scale consisted of three items, including: "I am satisfied with the time I spend sleeping;" "I am satisfied with my quality of sleep"; and "When I wake up, I feel refreshed." Scale items were summed to create a total sleep quality score, where higher scores represent better sleep quality.

**Demographics Questionnaire.** Participants were also asked to complete a demongraphics questionnaire, which asked about their socioeconomic status, race/ethnicity, and educational background.

## Procedure

An online version of this study was created through Qualtrics survey software, and the survey link was distributed to participants on the via Amazon Mechanical Turk. The study was advertised as "a study of sleep and well-being." After clicking the survey link, participants were informed of study procedures and content through an informed consent process. After completing the study, participants received academic credit as compensation and were presented with debriefing materials. The University of Oregon's s Office of Research Compliance (Institutional Review Board) approved this study.

## Data analysis

We used R (Version 3.4.3; R Core Team, 2017) and the R-packages *}cowplot* [@}R-cowplot], *bindrcpp* (Version 0.2.2; Müller, 2018), *dplyr* (Version 0.7.6; Wickham, François, Henry, & Müller, 2018), *forcats* (Version 0.3.0; Wickham, 2018a), *Formula* (Version 1.2.3; Zeileis & Croissant, 2010), *ggplot2* (Version 3.0.0; Wickham, 2016), *gridExtra* (Version 2.3; Auguie, 2017), *here* (Version 0.1; Müller, 2017), *Hmisc* (Version 4.1.1; Harrell Jr, Charles Dupont, & others., 2018), *janitor* (Version 1.1.1; Firke, 2018), *kableExtra* (Version 0.9.0; Zhu, 2018), *knitr* (Version 1.20; Xie, 2015), *lattice* (Version 0.20.35; Sarkar, 2008), *papaja* (Version 0.1.0.9842; Aust & Barth, 2018), *purrr* (Version 0.2.5; Henry & Wickham, 2018), *readr* (Version 1.1.1; Wickham, Hester, & Francois, 2017), *rio* (Version 0.5.10; C.-h. Chan, Chan, Leeper, & Becker, 2018), *stringr* (Version 1.3.1; Wickham, 2018b), *survival* (Version 2.42.6; Terry M. Therneau & Patricia M. Grambsch, 2000), *tibble* (Version 1.4.2; Müller & Wickham, 2018), *tidyr* (Version 0.8.1; Wickham & Henry, 2018), and *tidyverse* (Version 1.2.1; Wickham, 2017) for all our analyses. We calculated means and standard deviations for each of the total scale scores, and we separated means by socioeconomic status. We also calculated Pearson's r correlation coefficients between depressive symptoms, quality of life,

and sleep quality total scores. The authors interpreted our correlational results as small (.10-.29), medium (.30-.49), and large correlations (.50-1.00).

## Results

### Descriptive Statistics

The mean depression total score for the sample is 7.53 . The mean sleep quality total score for the sample is 9.94. The mean quality of life total score for the sample is 7.57. Mean total scores separated by socioeconomic status are listed in Table 1 and graphically displayed in Figure 1.

### Correlation Results

Depressive symptoms, sleep quality, and quality of life scores were significantly correlated with each other, $p < .05$ (see Table 2).

### Exploratory Analyses in Low SES Individuals

In order to look at these relationships specifically in Low SES individuals, we plotted the correlations between depressive symptoms, sleep quality, and quality of life in only low SES individuals (see Figure 2). To look sepcifically at the differences in scores on each depressive symptom, we subtracted the scores of low SES individuals from high SES individuals and plotted the differences (see Figure 3)

## Discussion

Our results confirmed that more depression symptoms were correlated with lower life quality and sleep quality. Whereas sleep quality was positively associated with life quality. The results were consistent with past literature and our hypothesis. Based on the symptoms from major depressive disorder diagnosis, a patient suffering from depression is likely to experience either hypersomnia or insomnia. Insomnia is most related to low sleep quality. Meanwhile, hypersomnia does not guarantee high sleep quality as much too long duration of sleep may cause dizziness and lethargy in the patients. In reverse, frequent sleep disturbances and the discomfort and stress that come with low sleep quality may negatively

impact a patient's everyday mood and reduce the general energy level to engage in more mood-boosting activities. These bidirectional influences may explain the negative correlation between depression and sleep quality that we detected with our sample. As sleep is an instrumental component in everyday life, lower sleep quality will inevitably decrease life quality. Higher life quality may consist of more comfortable sleeping environment and less sleep-hindering stress. These potential connections help elucidate the positive association between sleep quality and life quality. Limitations of our study lie in our correlational study design such that we were unable to examine causal relationship among the variables. We also relied on self-report measures which may be susceptible to reporter bias. Possible bias in this high risk sample include underreport depression symptoms due to low insight or emotional numbness, as well as overreporting symptoms due to Hawthorne effect or other motivations. In studies to follow, we will also adopt structured clinical interview and objective measures of the key variables. We will incorporate sleep intervention (e.g., insomnia cognitive behavior therapy) to manipulate the sleep quality level to examine causal relationship between depression symptoms and sleep quality. An active and a waitlist control groups will be recruited to rule out more confounds. More sophisticated statistical analyses such as multilevel modeling may be adopted. Clinical implications from the results may inform clinicians and the general public to pay more attention to sleep quality with an aim of keeping depression at bay or reducing depressive symptoms. In general, our study with a high risk sample demonstrated the intricate associations among depressive symptoms, sleep and life quality.

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Table 1

*Mean Depression, Sleep Quality, and Quality of Life Scores by SES Group.*

| SES | Mean Depression Score | Mean Sleep Quality Score | Mean Quality of Life Score |
|---|---|---|---|
| High | 7.37 | 9.94 | 7.74 |
| Low | 7.34 | 10.03 | 7.66 |
| Med | 7.72 | 9.86 | 7.45 |

*Note.* This table was created with apa_table()

Table 2

*Correlations between Depression, Sleep Quality, and Quality of Life Scores.*

| row | column | cor | p |
|---|---|---|---|
| Sleep Quality | Depression | -0.20 | 0.00 |
| Sleep Quality | Quality of Life | 0.22 | 0.00 |
| Depression | Quality of Life | -0.55 | 0.00 |

*Note.* This table was created with apa_table()

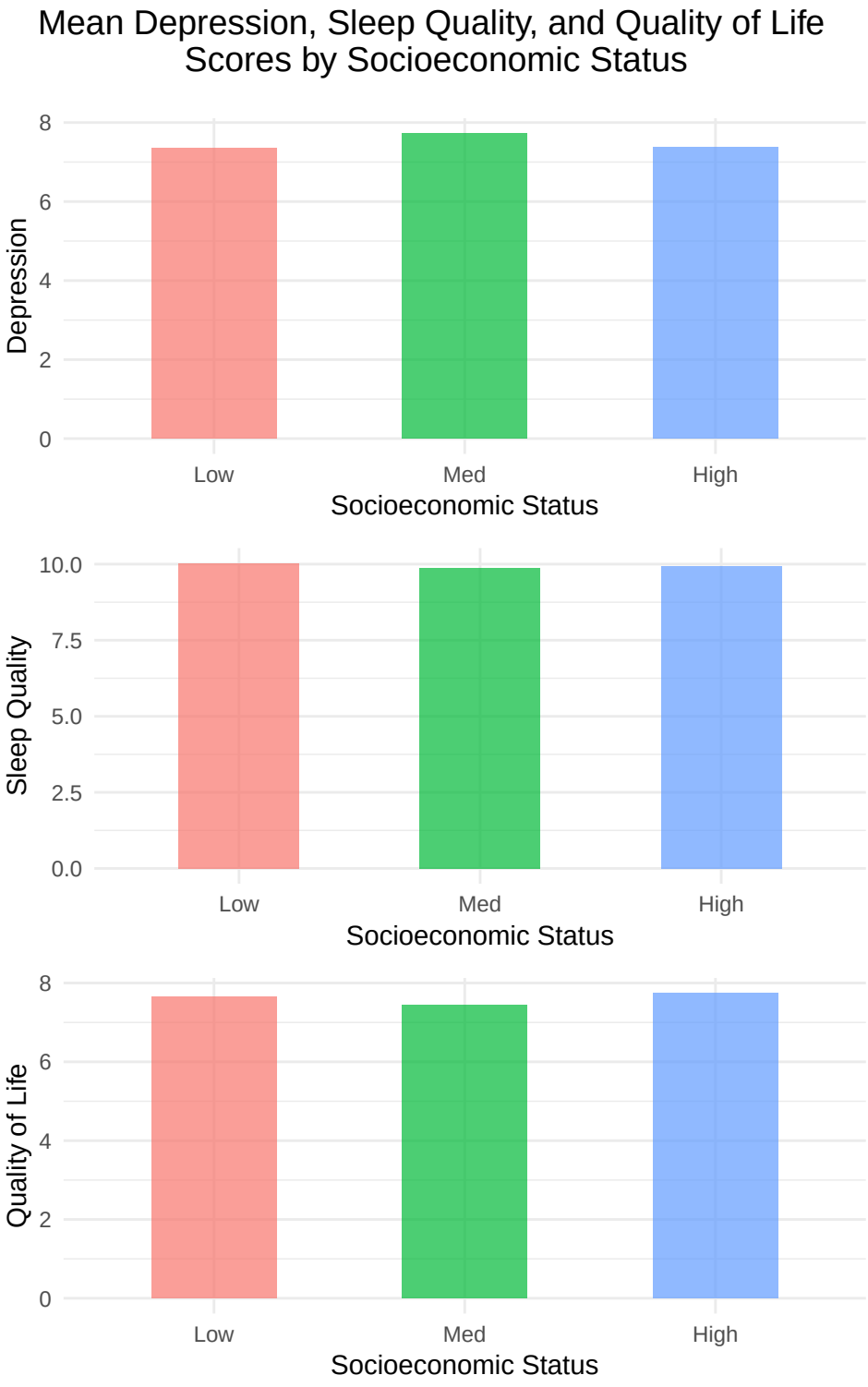
Mean Depression, Sleep Quality, and Quality of Life Scores by Socioeconomic Status
Depression
8
6
4
2
0
Low
Med
High
Socioeconomic Status
Sleep Quality
10.0
7.5
5.0
2.5
0.0
Low
Med
High
Socioeconomic Status
Quality of Life
8
6
4
2
0
Low
Med
High
Socioeconomic Status

*Figure 1*

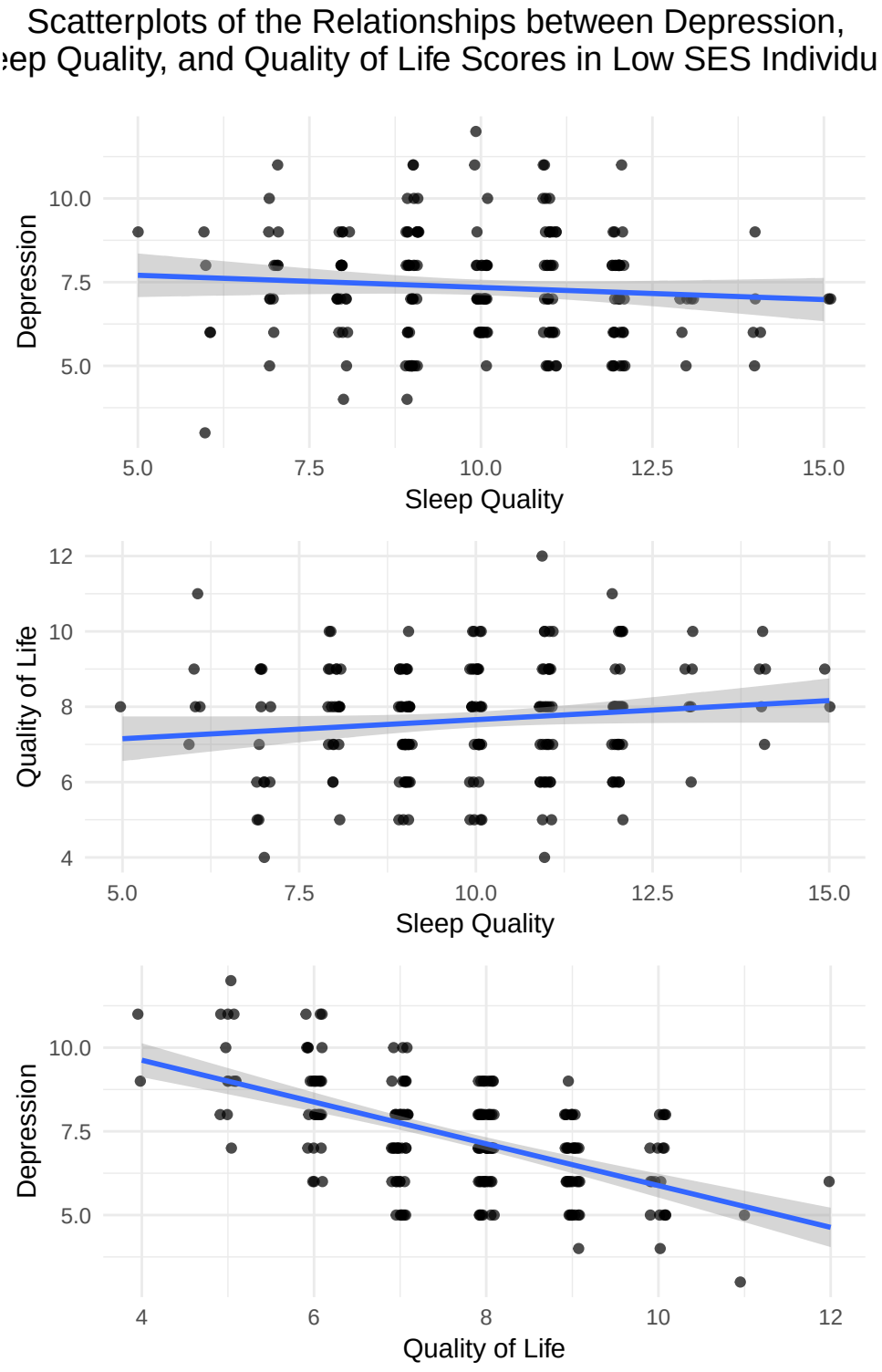
Scatterplots of the Relationships between Depression,
ep Quality, and Quality of Life Scores in Low SES Individu
Depression
10.0
7.5
5.0
5.0
7.5
10.0
12.5
15.0
Sleep Quality
Quality of Life
12
10
8
6
4
5.0
7.5
10.0
12.5
15.0
Sleep Quality
Depression
10.0
7.5
5.0
4
6
8
10
12
Quality of Life

*Figure 2*

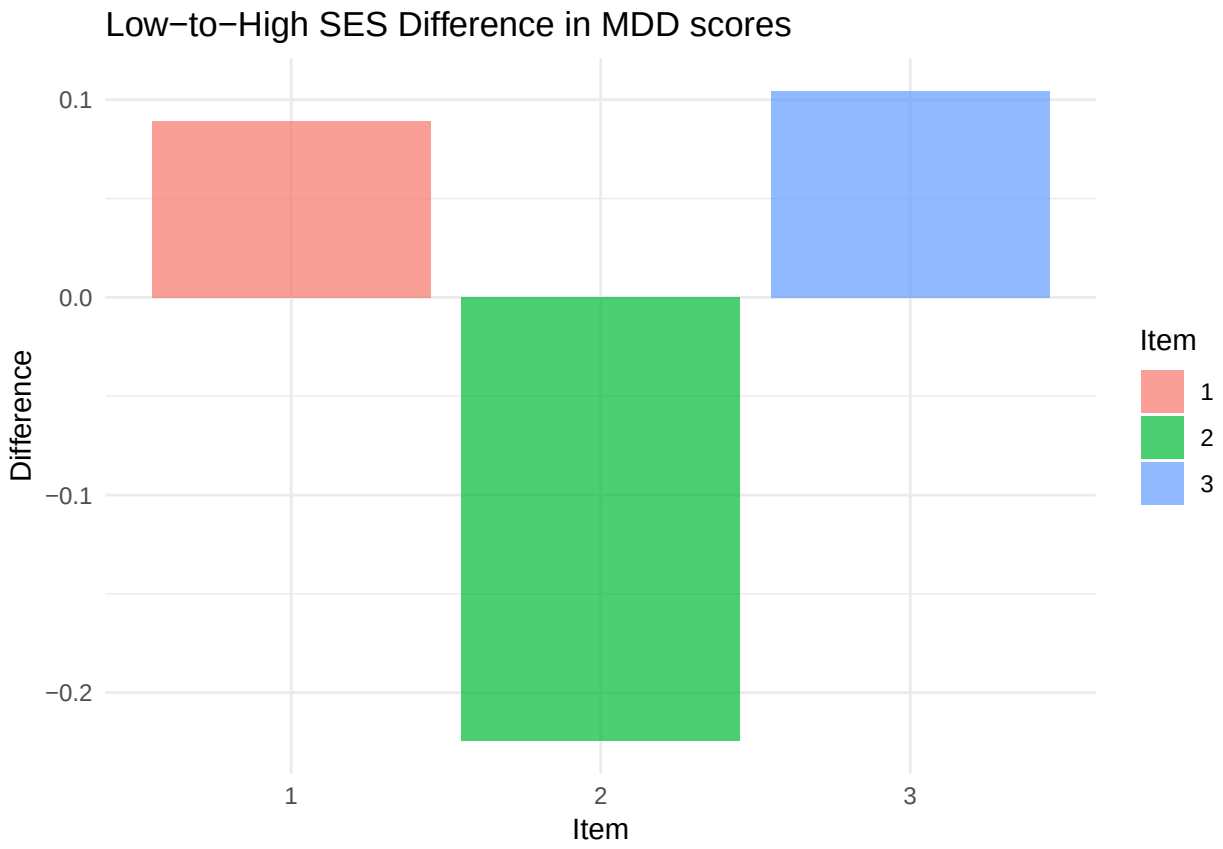
Low−to−High SES Difference in MDD scores
0.1
0.0
−0.1
−0.2
Difference
1
2
3
Item
Item
1
2
3

*Figure 3*