

BARRIERS AND FACILITATORS TO ANTIDEPRESSANT
ADHERENCE IN COLLEGE STUDENTS

by

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LIST OF ABBREVIATIONS

Abbreviation	Description
BMQ	Beliefs About Medicine Questionnaire
FATS	Facilitators of and Barriers to Adherence to Hypertension Scale
MARS	Medication Adherence Rating Scale
NIMH	National Institute of Mental Health
PHQ-9	Patient Health Questionnaire-9
VAS	Visual Analog Scale
WHO	World Health Organization

ABSTRACT

Introduction: Medication adherence to antidepressants prescribed to treat depressive disorders can heavily influence the effectiveness of treatment. Past research has shown that adherence to antidepressants is subject to the influence of various underlying factors that serve as both barriers and facilitators to adherence. This study aimed to assess those underlying factors in how they relate to antidepressant adherence and depression.

Method: Undergraduate students from Texas State University that had been prescribed antidepressants for a minimum of 2 months prior to the study were invited to participate in an online study via SONA systems. A total of 113 students participated in the current survey study, which consisted of six scales assessing adherence to antidepressants, barriers to adherence, facilitators to adherence, and severity of depression. **Results:** The hypotheses presented were partially supported. Adherence decreased as the presence of the barriers increased and increased as the presence of facilitators increased. Differences between groups categorized by severity of depression were found for three of six addressed barriers and for adherence. Differences between groups were not found for any of the addressed facilitators. **Conclusion:** Results from this study suggest the need for further research into the relationships between adherence and depression, as well as the various underlying factors that may influence them.

I. INTRODUCTION

Adherence is the degree to which a patient follows guidelines that have been agreed upon between them and their health-care provider (Osterberg & Blaschke, 2005). According to a 2003 report published by the World Health Organization (WHO), adherence is a broad term that includes a wide variety of treatment-related behaviors for both chronic and acute diseases. As adherence-related behaviors are incredibly diverse, adherence-related research generally focuses on adherence to the treatment of specific diseases.

Overview of the Current Study and Adherence

The focus of the current study was adherence to mental health medications, specifically antidepressants targeting depressive disorders. This study focused on the population of college students, who have high rates of depression but do not tend to be a focus of adherence research. Thus, the literature review provides background on adherence terminology and interventions, common barriers to adherence in depressive disorders, adherence in depressive disorders, and adherence in college students.

According to the 2017 National Survey on Drug Use and Health, an estimated 46.6 million (18.9%) adults aged 18 or older suffered from a mental health disorder in 2017, with 42.6% of those adults receiving mental health services or treatment (WHO, 2003). Adherence to mental health treatment or medications includes numerous behaviors, such as filling prescriptions, attending appointments, and self-management in various forms (e.g., following dietary restrictions, lifestyle recommendations, time management in taking medications, etc.) (WHO, 2003). Maintaining adherent behavior often proves to be a significant challenge for patients, for reasons to be discussed below,

resulting in high rates of nonadherence, which is defined as a failure to adhere. Across chronic illnesses, the number of patients that fail to adhere to their medication regimens has been found to be approximately 50% (Brown & Bussell, 2011). Rates of adherence specifically to antidepressants have been shown to be similar to rates of adherence to medications prescribed for other chronic illnesses, with eight studies examining adherence to antidepressants over a 6-month period, displaying an average adherence rate of 53.8% (Sansone & Sansone, 2012). Definitions of nonadherence differed between these studies with several defining nonadherence as a patient failing to fill/refill their prescription in a set amount of time and others defining nonadherence as a patient taking inadequate doses or failing to take doses of their medication(s).

As previously stated, nonadherence is a failure to adhere (i.e., a patient failing to follow the guidelines that have been agreed upon by them and their health-care provider). There are two distinct categories of nonadherence: intentional and unintentional (Hugtenburg et al., 2013). Intentional nonadherence, sometimes referred to as intelligent nonadherence, occurs when a patient purposely does not follow the guidelines agreed upon by them and their health-care provider (e.g., choosing not to take their medication), whereas unintentional nonadherence, sometimes referred to as erratic nonadherence, occurs when a patient inadvertently fails to follow the guidelines agreed upon by them and their health care provider (e.g., forgetting to take their medication). As psychiatric disorders commonly affect reasoning and insight, intentional nonadherence is often problematic for patients in adhering to mental health medications (Colom & Vieta, 2002). Unintentional nonadherence is also a common issue when dealing with mental health medications, as mental health medications tend to require daily doses, which can be

difficult to track. Intentional nonadherence is less common than unintentional nonadherence and more difficult to identify in real time, as the nonadherent behavior is a reasoned choice (WHO, 2003).

The existence of multiple avenues of nonadherence likely contributes to the difficulty of providing effective interventions (Chisholm-Burns & Spivey, 2012). The variability in reasons behind patients' nonadherence (i.e., some patients fail to adhere as a result of tangible barriers, some as a result of social barriers, some as a result of their lifestyle, etc.) eliminates the possibility of a one-stop solution to adherence-related issues. However, past literature suggests a three-factor heuristic model in guiding health-care providers toward helping most patients improve their adherence, with the three factors in this model being (1) educating patients so that they understand the purpose of their medication and how to properly adhere, (2) motivating patients to commit to their treatment regimens and helping them to believe in their treatments' importance, and (3) assisting patients in any practical barriers (cost, transportation, etc.) that they may face (DiMatteo et al., 2012).

Barriers to Adherence

A barrier to adherence is anything that impedes a patient from following their treatment regimen properly. This includes various factors related to the patient, health-care provider, and tangible obstacles (Osterberg & Blaschke, 2005). Common barriers to adherence include medication side effects, treatment efficacy, patient lifestyle, forgetfulness, tangible issues, and beliefs about medication and medication-related issues. Depression has been found to affect adherence in multiple ways, leading to a need for an investigation of how depression may interact with common barriers to adherence (Chong

et al., 2011).

Side Effects

The severity and prevalence of side effects caused by medications targeting depressive disorders vary on a case-by-case basis (National Institute of Mental Health, 2016). The most common side effects of antidepressants include nausea, changes to weight, diarrhea, sleepiness, and sexual problems, with more severe side effects including suicidal thoughts/attempts, worsening depression, worsening anxiety, irritability, panic attacks, insomnia, increased impulsivity, mania, and other unspecified changes in behavior/mood (NIMH, 2016). Of these side effects, those most commonly implicated in nonadherence during long-term pharmacological treatment are sexual dysfunction, changes in weight, abnormal fatigue, and insomnia (Ferguson, 2001). Side effects resulting from medications threaten adherence, with research repeatedly showing that patients who report experiencing side effects as a result of their medication(s) demonstrate significantly increased odds of nonadherence—extrapyramidal side effects (i.e., drug-induced movement disorders) have shown a 43% reduction in odds of a patient being adherent, metabolic side effects have shown a 36% reduction in odds, and cognitive side effects have shown a 30% reduction in odds (Dibonaventura et al., 2012; Zhang et al., 2016). However, regardless of whether or not a patient experiences side effects resulting from their medication, properly adhering to their treatment regimen more often than not yields positive results, with patients who properly adhere being reported as having increased mental health and being hospitalized significantly less than patients who do not adhere (Dibonavaentura et al., 2012). According to the Federal Drug Administration, abruptly stopping a medication that targets mental health may result in a

patient experiencing an increase in adverse symptoms. Nonadherence caused by side effects can result from a lack of knowledge on the patient's behalf, poor judgment from a health care provider as to what medications are appropriate for an individual patient, or from a patient feeling overwhelmed and unable to cope with the side effects that they experience.

Efficacy

Treatment efficacy refers to the degree to which a patient believes their treatment regimen works. Treatment efficacy is positively correlated with a patient's ability to cope with their treatment (Zhang et al., 2016); a patient who believes their treatment will have a positive impact on their life is more likely to be successful in coping with negative side effects that result from their treatment. Making sure a patient understands and believes in the importance of their treatment and proper adherence is an important aspect of improving adherence. Specifically, many patients consciously decide not to take their medication (Osterberg & Blaschke, 2005). Poor treatment efficacy has been shown to significantly influence medication adherence when the prescribed medication has delayed results (Yelamos et al., 2015), which is often the case with medications that target mental health disorders. As a result of this, treatment efficacy is both a significant obstacle in adherence to medications that treat mental health disorders, as well as a valuable variable in identifying high-risk patients regarding nonadherence.

Problems Taking Medication

The treatment of chronic illnesses and mental health disorders through pharmacotherapy often goes hand-in-hand not only with demanding medication regimens, but also with significant lifestyle changes (WHO, 2003). Proper adherence to a

medication regimen does not end with taking the medication on time; it also includes both understanding and respecting the limitations on one's lifestyle that comes with proper usage of the medication to reap optimum benefits from it (Brown & Bussell, 2011). The lifestyle requirements that come with taking mental health medications vary from medication to medication, with common restrictions being that patients may not be able to consume alcohol or may not be able to operate heavy machinery after taking their medication. Another common requirement of proper medication adherence that may influence patient lifestyle is having to take medication(s) at a specified time daily. A patient's ability and willingness to modify his/her lifestyle in accordance with their treatment regimen has been shown to be significantly correlated with proper adherence (Yu-Mi et al., 2018). As such, evaluating a patient's willingness to abide by the changes that may come along with their treatment may serve as a way to predict adherence.

Forgetfulness

Forgetfulness is a much more significant barrier to adherence than one may think, with studies showing that rates of nonadherence resulting from patient forgetfulness can be as high as 62% (Gadkari & McHorney, 2012). The issue of nonadherence resulting from forgetfulness poses a challenge to health care providers unique from cases of intentional nonadherence, with intervention strategies targeting patient attitude and/or patient knowledge being irrelevant. However, nonadherence resulting from forgetfulness can be combatted through various methods, including the previously discussed method of measuring adherence, having a patient keep a diary of their treatment (Santoleri et al., 2019), and is also commonly addressed through specialized smart pill-boxes designed to help patients to remember what medication they need to take each day of the week or

technologies such as reminder apps and others that address forgetfulness. Identifying patients who have previously suffered from nonadherence as a result of forgetfulness as well as patients who suffer from general memory lapses could predict and, consequently, reduce nonadherence.

Access

Tangible barriers to medication adherence include an inability to afford prescribed treatment and/or an inability to perform or attend treatment. Assessing the significance of tangible barriers to adherence for a particular patient is straightforward in practice, but helping a patient overcome those barriers may prove difficult due to various limitations in the healthcare system. The economic situation revolving around adherence issues can seem convoluted, with the United States spending in the hundreds of billions of dollars yearly on prescription drugs (National Center for Health Statistics, 2012) despite adherence rates being as low as 50% (Brown & Bussell, 2011). Identifying patients susceptible to tangible barriers may result in reduced rates of nonadherence and, subsequently, reduced hospitalizations and costs to the healthcare system (Iuga & McGuire, 2014).

Beliefs About Medication

A patient's beliefs about medication and medication-related issues are directly related to whether or not they will choose to properly adhere. Unlike treatment efficacy, which, as previously discussed, refers to whether or not a patient believes that their treatment will work for them, beliefs about medication and medication-related issues refer to a patient's beliefs about medication in general. Patients who have negative beliefs about medication, including believing that medication use may disrupt their lives, that

they may become dependent on medication, that their medication may be ineffective, or that their healthcare provider has prescribed them medication they do not need, have been shown to be as much as 49% less likely to adhere than patients who do not have negative beliefs about medication (Gagnon et al., 2017).

Adherence and Depressive Disorders

Depression has been implicated as a factor in nonadherence to treatments for various chronic diseases in the United States, with one meta-analysis of the issue, conducted by Grenard and colleagues (2011), finding across 21 studies encompassing 18,245 total participants that depressed patients are 1.76 times more likely to be nonadherent than nondepressed patients. Qualitative, structured interview approaches toward understanding the relationship between depression and adherence have identified patient-specific, medication-specific, healthcare/health system related, social/cultural, and logistics-related barriers to adherence in depressed patients (Ho et al., 2017). Facilitators identified through similar qualitative approaches include patient insight, perceived health benefits, active-lifestyles, positive patient-provider relationships, usage of reminders, and access to supportive social networks (Ho et al., 2017). In another meta-analysis examining depression as a risk factor for improper adherence to medical treatment, DiMatteo and colleagues (2000) found both depression and anxiety to be linked to noncompliance (i.e., failing to or refusing to comply with prescribed treatment) in medical treatment. Their research included 12 articles observing the relationship between depression and noncompliance and 13 articles observing the relationship between anxiety and noncompliance. Although their findings indicated no significant relationship between anxiety and noncompliance, the relationship between depression and noncompliance was

found to be significant with an odds ratio of 3.03, suggesting that patients with depression are 3.03 times more likely to be noncompliant than patients without depression. Rates of adherence specifically to antidepressants have been shown to be similar to rates of adherence to medications prescribed for other chronic illnesses, with eight studies examining adherence to antidepressants over a 6-month period displaying an average adherence rate of 53.8% (Sansone & Sansone, 2012). Reasons behind the high rates of nonadherence throughout these studies were similarly as varied as those found through qualitative approaches (e.g., concerns about side effects, fears of becoming dependent on medications, a lack of efficacy, a lack of knowledge regarding proper adherence to prescribed treatments). Nonadherence to antidepressants has also been linked to patients believing they had no say in their prescription, suggesting that proper communication between patient and healthcare provider is essential in establishing adherent behavior (Bauer et al., 2008). The importance of the relationship between patients and their healthcare providers has been shown in other studies as well, with one such study finding that patients receiving treatment/advice from multiple providers were significantly less adherent than patients being treated by a single provider (Bambauer et al., 2007).

Despite the overwhelming amount of research focused on depression, antidepressants, and medication adherence both in general and specific to treatments of depressive disorders, evidence of consistently beneficial interventions is lacking (Pampallona et al., 2002). Interventions that have proven to be successful are multifaceted and complex, targeting several common barriers to medication (often support and knowledge or education), and require both proactive care and the attention of specialized mental health professionals (Chong et al., 2011). Interventions targeting

single barriers, such as knowledge/education, have been shown to be ineffective more often than not (Chong et al., 2011).

Depressive Disorders and College Students

Next to anxiety, depression is the second most prevalent mental health concern in college students, with up to 41.1% of college students showing signs of moderate to severe depression (Duffy et al., 2019). Literature related to antidepressant adherence in college students often focuses on the stressors and stigmas underlying nonadherence and prescription medication misuse (Hammonds et al., 2015). Past research suggests that depressed college students are subject to a number of stressors that may affect their depression and subsequently their medication use/misuse, including roommate issues, academic stress, financial/career concerns, and familial expectations (Aselton, 2012). Often, nonmedical methods of coping (e.g., exercise, self-talk, medication, marijuana use, listening to music) have been cited as being more effective than medication therapy (Aselton, 2012). This may be exacerbated by a number of other findings, including both a lack of proper education regarding the nature of mental health disorders (Stone & Merlo, 2011), as well as undertreatment of depression in college students. In a 2005 study, Tjia and colleagues found that only 26.5% of students displaying symptoms of a depressive disorder had received any sort of treatment; in this study, treatment for depression was found to be significantly associated with both personal/family histories of depressive disorder and older age. These findings suggest that many college-aged students, despite being subjected to significant stressors, do not receive proper education into depressive disorders, leading many to go untreated. Furthermore, even when treated, college-aged students have been shown to misuse psychiatric medication by overusing stimulants in

attempts to improve their abilities to study, and using benzodiazepines (commonly prescribed alongside antidepressants in the treatment of depression) to get high (Stone & Merlo, 2011).

Efforts to analyze and remedy the lack of adherence to mental health medications in college students have commonly touched on several issues: forgetfulness, gaps in knowledge, attitudes toward mental disorders, and beliefs about the efficacy of different psychiatric medications (Hammonds et al., 2015; Pedrelli et al., 2014; Stone & Merlo, 2011). In investigating the issue of forgetfulness, Hammond et al. (2015) found strong trends indicative of medication reminder phone apps being helpful. However, according to other findings, it has been concluded that the problem is not as simple as making sure that college students remember when they are supposed to take their pills—college students face barriers to proper maintenance of their mental health that can interfere with not only their adherence once they have been prescribed treatment, but also with their initial help-seeking behaviors. These barriers include negative social stigma toward seeking mental health care, a lack of efficacy in mental health related services, and other general barriers (e.g., feelings of hopelessness, desires to be self-sufficient instead of relying on therapy/medication; Gee et al., 2020).

II. RESEARCH QUESTIONS, HYPOTHESIS AND METHOD

The reviewed literature has thoroughly described factors associated with adherence in depressed patients and attempts to provide interventions to this population. It is clear that adherence in depressed populations is influenced by a multitude of underlying factors, and these factors may be different for college students than for the general population. In pursuit of further understanding of the barriers and facilitators for college students and with an eventual goal of providing clear avenues in which adherence in depressed populations may be improved, this study set out to answer the following five research questions.

1. Which barriers to adherence are related to antidepressant adherence in college students with depression? Taking the discussed literature into account, it is hypothesized that scores on all addressed barriers to adherence (side effects, efficacy, problems taking medication, forgetfulness, access, beliefs about medication) will be negatively associated with adherent behavior.

2. Which facilitators to adherence are related to antidepressant adherence in college students with depression? It is hypothesized that all facilitators (support, positive behaviors, knowledge) being addressed will be positively associated with adherent behavior.

3. Is severity of depression related to the prevalence of specific barriers to adherence? It is hypothesized that the prevalence of specific barriers to adherence (side effects, efficacy, problems taking medication, forgetfulness, access, support, beliefs about medication, patient-physician trust) will be higher in severely depressed individuals than in minimal to moderately depressed individuals.

4. Is severity of depression related to the prevalence of specific facilitators to adherence? It is hypothesized that the prevalence of specific facilitators to adherence (support, positive behaviors, knowledge) will be lower in severely depressed individuals than in minimal to moderately depressed individuals.

5. Does severity of depression relate to rates of adherence to antidepressants meant to treat depressive disorders? It was hypothesized that severity of depression will be negatively associated with adherence.

Method

Study Design

This correlational study used online survey methodology. The online survey consisted of 68 total questions from seven different questionnaires, including a demographics survey. The study was administered online in its entirety with no designated breaks between survey blocks. The compiled and modified questionnaires measured participants' self-reported adherence to medications meant to treat their depression, factors that affect their adherence, the severity of their depression, and details regarding their treatment plans for their depression.

Participants

Participants consisted of undergraduate Texas State University students enrolled in the Department of Psychology's human participant pool from SONA systems. All participants enrolled in this study were 18 years of age or older. Gender, racial/ethnic composition, age, occupation, and other demographic information were not used as exclusionary criteria for this study. The only inclusionary criteria for this study was that participants must have been prescribed antidepressants to treat a depressive disorder at

the time of participation and for a minimum of 2 months prior to participation.

Procedure

After providing informed consent, participants completed a series of questionnaires through the online survey software Qualtrics. The questionnaires assessed the participants' self-reported adherence to their medication(s) prescribed to treat their depressive disorder(s), facilitators to their adherence, barriers to their adherence, their general beliefs about medication, the current severity of their depression, general demographic information (e.g., age, gender, ethnicity), and general information regarding the nature of their treatment regimen (e.g., amount of medications prescribed, time since diagnosis, and how long their current treatment regimen had been prescribed). The contents of this study were approved by the Texas State University Institutional Review Board (IRB) on March 23, 2020.

Measures

The online survey included questionnaires measuring demographics and depression treatment questions, adherence, facilitators and barriers to adherence, and symptoms of depression.

Demographics

Participants completed a demographic survey consisting of questions about their age, gender, and ethnicity. They were also asked to provide information on their medication use as it concerned their depression (amount of medications prescribed, if their prescription had recently changed, how long they had been prescribed antidepressants, and who provided their prescription). They were also asked to indicate how long it had been since they were first diagnosed with depression.

Adherence

Participants completed a Visual Analog Scale (VAS) assessing adherence (Kalichman et al., 2009). Participants were asked to score their adherence to their medication(s) prescribed for their depression from 0% to 100%, with 0% being that they had taken none of their medication(s) prescribed for their depression in the past 2 months and 100% being that they had taken all of their medication(s) prescribed for their depression in the past 2 months. This VAS measure of adherence has been found to display moderate levels of association with other measures (unannounced pill count, $r = .48$; self-report recall, $r = .58$, all significant at $p < .01$) (Kalichman et al., 2009).

Adherence and specific attitudes that the participants had toward their medication(s) were also assessed through the Medication Adherence Rating Scale (MARS), a scale developed to measure patient adherence to psychoactive medications, which includes medications targeting depressive disorders (Thompson et al., 2000). The MARS is a 10-item questionnaire that consists of yes/no questions. The questions assess medication adherence behavior (e.g., “Do you ever forget to take your primary medication?”), as well as participants’ attitudes toward their adherence behavior (e.g., “I take my medication only when I am sick”), and negative side effects that participants suffer (e.g., “I feel weird, like a ‘zombie’ on medication”). The MARS is scored on a continuous scale with a higher sum total of all scores indicating better adherence, the highest score possible being 20. The MARS has demonstrated good reliability with a Cronbach’s alpha of .75, and test-retest reliability using a 2-week interval of .72 (Thompson et al., 2000).

Facilitators and Barriers to Adherence

The Facilitators of and Barriers to Adherence to Hypertension Scale (FATS; Fongwa et al., 2014), modified for adherence to medication(s) prescribed for depression, is a 17-item questionnaire scored on a 1 to 5 Likert-scale, with 1= *none of the time* and 5 = *all of the time*. The FATS consists of 4 subscales: social support, positive behavioral patterns to increase adherence, barriers to recommended treatments, and knowledge. These subscales cover facilitators to adherence as well as the previously discussed barrier to adherence “support.” Overall facilitators to adherence are assessed as a continuous variable represented by the sum total of each subscale. The sum of each subscale is assessed as the specific facilitator/barrier that it represents. Example items for these subscales are respectively as follows: “having someone who checks on my mental health helps me to stick to my treatment,” “I use reminders to help me to remember to take my primary depression medication,” “stress in life has negatively affected my ability to stick to my depression treatment plan,” and “my knowledge about depression grounds me on what I should or should not do.” The FATS has demonstrated good reliability with a Cronbach’s alpha of .78 (Fongwa et al., 2014).

Another measure of predictors of participants’ adherence was used in this study. This study included 14 selected items from the Barriers to Adherence Scale (Haskard-Zolnierok & Howard, 2020). Each item is scored on a Likert scale ranging from 1 to 5, with 1 being *strongly disagree*, and 5 being *strongly agree*. A higher score on each of the subscales is indicative of a greater presence of the scale’s respective barrier (e.g., a higher score on “efficacy” indicates the participant lacks confidence in their medication, and a higher score on “forgetfulness” indicates that the participant has difficulty remembering

to and/or how to properly take their medication). The selected items cover 5 subscales: efficacy, side effects, problems taking medication, forgetfulness, and access. The efficacy subscale consisted of 4 items, the side effects subscale consisted of 2 items, the problems taking medication subscale consisted of 3 items, the forgetfulness subscale consisted of 2 items, and the access subscale consisted of 3 items. Scores were computed using the means of each subscale. Example items from these subscales are respectively as follows: “the dosage of my primary medication is not correct,” “I’m afraid I might experience side effects,” “taking my medication is a hassle,” “I forget to take my primary medication,” and “I do not have health insurance to pay for my primary medication.”

The barrier to adherence “beliefs about medication” was evaluated based on participants’ scores on the Beliefs About Medicine Questionnaire – General (BMQ; Jimenez et al., 2016). The BMQ consists of eight total items which are scored on a 5-point Likert scale, with 1 = *strongly disagree*, and 5 = *strongly agree*. The BMQ is broken down into two 4-item factors, with one factor assessing beliefs that medications are harmful (e.g., “most medicines are addictive”) and the second assessing beliefs that medications are overused or overprescribed (e.g., “doctors use too many medicines”). The BMQ is scored on a continuous scale using means, with higher scores indicating more negative perceptions of medications. Both factors of the BMQ have shown good reliability with alphas of .69 and .79 for the harm and overuse subdomains, respectively (Horne et al., 1999; Jimenez et al., 2016).

Depression

The Patient Health Questionnaire (PHQ-9) was used to assess the severity of participants’ depression (Spitzer et al., 1999). The PHQ-9 is a 9-item questionnaire

scored on a 0 to 3 Likert scale, with 0 = *not at all*, and 3 = *nearly every day*. Items on the PHQ-9 include the patient responding to how often they feel “little interest or pleasure in doing things,” how often they suffer from “poor appetite or overeating,” and other similarly relevant inquiries into the depressive symptomology of participants. The possible range of scores on the PHQ-9 is 0 to 27. A score of 0 to 4 indicates minimal depression, a score of 5 to 14 indicates mild to moderate depression, and a score of 15 to 27 indicates moderately severe to severe depression. Based on which range of scores they fall under, participants are categorized as having either minimal, moderate, or severe depression. In this study, participants were separated into three categories: those with minimal depression (score of 0 to 4), those with moderate depression (score of 5 to 14), and those with severe depression (score of 15 to 27). The internal consistency of the PHQ-9 is strong, with it previously displaying a test-retest correlation of .91 (Lamers et al., 2008; Spitzer et al., 1999).

Statistical Analysis

The Visual Adherence Scale (VAS) and Medication Adherence Rating Scale (MARS) were found to correlate significantly with one another, $r = .52, p \leq .01$. Given that the MARS is a more extensive measure of adherence, the decision was made to utilize it over the VAS in analyses.

To answer research question 1, a correlational analysis was conducted between adherence (measured using the MARS) and each of the specific barriers to adherence being addressed in this study (side effects, efficacy, problems taking medication, forgetfulness, and access measured by the Specific Barriers to Adherence Scale, and beliefs about medication measured by the Beliefs about Medication Scale).

Research question 2 was answered by conducting a correlational analysis between adherence (measured using the MARS) and the specific facilitators to adherence being addressed in this study (measured by the FATS).

Research question 3 was answered by conducting a one-way ANOVA between the minimal, moderate, and severe depression groups (categorized by the PHQ-9) and aggregate scores on the barriers to adherence.

Research question 4 was answered by conducting one-way ANOVAs between the minimal, moderate, and severe depression groups (categorized by the PHQ-9) and each of the specific facilitators to adherence being addressed in this study.

Research question 5 was answered by conducting a one-way ANOVA between the minimal, moderate, and severe depression groups (categorized by the PHQ-9) and adherence (measured using the MARS).

III. RESULTS

Sample Characteristics

There were 113 total participants included in this study. One participant was excluded from select analyses as a result of missing data, but no participants were completely excluded. There were 86 (76.1%) female participants, 25 (22.1%) male participants, and 2 (1.8%) participants that chose not to identify their gender. Participants were primarily Caucasian, with 56 (49.6%) identifying as such. There were 28 (24.8%) Hispanic/Latino participants, 16 (14.2%) African/African American participants, 4 (3.5%) Asian/Asian American participants, and 8 (7.1%) participants who reported other/chose not to say. Participant ages ranged from 18 to 28 years old, and 102 (90.3%) of the participants were 18 to 21 years old. All participants indicated that they had been prescribed antidepressants meant to treat a depressive disorder for 2 or more months prior to participation, with 13.3% indicating 2 months, 37.2% between 2 and 6 months, 28.3% between 6 months and 1 year, and 18.6% for longer than 1 year. Participants also indicated how many medications to treat depression they were currently prescribed at the time of participation, with 68.1% being prescribed one medication, 22.1% prescribed two medications, and 8.9% prescribed 3 or more medications. Details regarding the sample's characteristics are displayed in Table 1.

For select analyses, participants were separated into three groups (minimal depression, moderate depression, severe depression) based on their scores on the PHQ-9. The minimal depression group consisted of 41 participants, the moderate depression group consisted of 59 participants, and the severe depression group consisted of 12 participants. One participant did not complete the PHQ-9 and was therefore excluded

from these analyses. Means, standard deviations, ranges, and internal reliability analyses for each scale used can be found in Table 2.

Research Questions

Research Question 1

The first research question sought to understand which barriers to adherence were related to antidepressant adherence in college students with depression. To assess which targeted barriers to adherence, if any, were related to antidepressant adherence in college students with depression, correlational analyses were conducted. Statistically significant negative correlations were found between adherence and each specific barrier to adherence, as shown in Table 3. These findings showed that each addressed barrier to adherence (side effects, efficacy, problems taking medication, forgetfulness, access, and beliefs about medication) was negatively associated with adherent behavior, supporting hypothesis 1, which hypothesized that each barrier to adherence being addressed would be negatively associated with adherent behavior (i.e., as the presence of a barrier increases, scores on the adherence measure tend to decrease). In regard to “efficacy,” it’s important to note that a higher score is indicative of a perception of lack of efficacy or confidence in treatment/medication.

Research Question 2

The second research question examined which facilitators to adherence were related to antidepressant adherence in college students with depression. To assess the relationships between the facilitators to adherence being addressed (support, positive behaviors, knowledge), correlational analyses were conducted. Statistically significant positive correlations, displayed in Table 4, were found between adherence and support, r

= .24, $p = .012$, adherence and positive behaviors, $r = .30$, $p \leq .001$, and adherence and knowledge), $r = .29$, $p \leq .001$. These findings show that there was a positive association between self-reported adherence and the three addressed facilitators of adherence (i.e., as the presence of each facilitator increased, scores on the adherence measure tended to increase as well).

Research Question 3

The third research question attempted to understand if severity of depression was related to the prevalence of specific barriers to adherence. To address research question 3, participants' scores on the PHQ-9 were calculated and used to separate them into three groups: minimal depression, moderate depression, and severe depression. A one-way ANOVA was conducted to determine any differences between depression groups (minimal, moderate, severe) in relation to barriers to adherence. Statistically significant differences were found between groups for the barrier "efficacy" ($F(2,108) = 5.21$, $p = .007$). Significant differences were again found between groups for the barrier "problems taking medication" ($F(2,109) = 7.12$, $p = .001$). Finally, significant differences were found between groups for the barrier "forgetfulness" ($F(2,108) = 4.61$, $p = .012$). Significant differences were not found between groups for the barriers "side effects" ($F(2,109) = 2.84$, $p = .063$), "access" ($F(2,108) = 1.10$, $p = .336$), or "beliefs about medication" ($F(2,108) = 1.19$, $p = .309$). These findings partially supported hypothesis 3, which hypothesized that each barrier to adherence would see significant differences between depression groups, with the groups scoring higher in depression also scoring higher in the barriers. Post-hoc comparisons revealed that "efficacy" held significantly different results between the minimal and severe depression groups, "problems taking

medication” between the minimal and moderate as well as the minimal and severe groups, and “forgetfulness” between the minimal and severe groups. Means, standard deviations, and post hoc comparisons using Tukey’s HSD are shown in Tables 5a and 5b.

Research Question 4

The fourth research question explored if severity of depression was related to the prevalence of specific facilitators to adherence. Three one-way ANOVAs were conducted to assess the possibility of differences between depression groups (minimal, moderate, severe) in relation to facilitators of adherence. No statistically significant differences were found between groups in “support” ($F(2,109) = 1.45, p = .239$). Similarly, no significant differences were found between groups in “positive behaviors” ($F(2,107) = 1.17, p = .315$). Finally, differences approaching significance were found between groups in “knowledge” ($F(2,107) = 3.03, p = .053$). Means and standard deviations and post hoc comparisons using Tukey’s HSD are shown in Tables 6a and 6b.

Research Question 5

Research question 5 assessed whether severity of depression was related to rates of adherence to antidepressants in depressed college students. A one-way ANOVA was conducted to determine any differences between depression groups (minimal, moderate, severe) in relation to adherence as measured by the MARS. Significant differences were found between groups ($F(2,106) = 7.45, p = .001$). Post hoc comparisons using Tukey’s HSD revealed significant differences between the minimal group and the moderate group, as well as between the minimal group and the severe group. However, there was not a significant difference between the moderate and severe groups. These findings indicate that adherence was significantly higher in the minimal group than in both the moderate

and severe groups, but it was not significantly different in the moderate group compared to the severe group, thereby partially supporting hypothesis 5. Means and standard deviations and post hoc comparisons using Tukey's HSD are shown in Tables 7a and 7b.

IV. DISCUSSION

This study examined the relationships between severity of depression, antidepressant adherence, specific barriers to adherence, and specific facilitators of adherence in college students taking antidepressant medication. This study used correlational analyses of self-reported identification with multiple barriers to and facilitators of adherence, as well as factorial analyses that separated participants based on severity of depression (minimal, moderate, severe). Descriptive statistics showed that the majority of participants were Caucasian females. Furthermore, at the time of participation, 68.1% of participants were currently prescribed one medication to treat their depression, 22.1% were prescribed two, 6.2% were prescribed three, and 2.7% were prescribed more than three.

The first research question this study set out to answer concerned the following barriers to adherence: side effects, efficacy, problems taking medication, forgetfulness, access, and beliefs about medication and their relationships with adherence to antidepressant medications. The hypothesis for this research question was that participants' adherence would decrease as their scores on each barrier to adherence being addressed increased. It was found that each of the addressed barriers to adherence were significantly negatively correlated with antidepressant adherence, indicating that as identification with any of the addressed barriers to adherence increased, self-reported adherent behavior decreased, confirming the stated hypothesis.

It is important to note that, although each of the barriers to adherence being addressed were implicated similarly to each other in their relationships with antidepressant adherence, they are separate in context from each other. Each of the

barriers to adherence being significantly negatively correlated with participants' adherence indicates that challenges in participants' adherence may result from a variety of sources. These findings support previous research suggesting the existence of multiple reasons behind lapses in adherence (Chisholm-Burns & Spivey, 2012), as well as research specific to antidepressant nonadherence, which has similarly found lapses in adherence to have multifaceted underlying problems (Aselton, 2012). Previous findings related specifically to college students, which have been shown to suffer from forgetfulness as well as negative attitudes toward both mental health disorders and the efficacy of different medications are also supported by the current study's findings (Hammonds et al., 2015). In addition to the findings regarding the barriers observed in this study, as has been presented in previous research, adherence-related research and treatment specifically in college students should be expanded to include other common difficulties uniquely prevalent in that population, including academic-related stress, familial issues, and peer pressure (Stone & Merlo, 2011).

The second research question concerned facilitators to adherence (taking charge, positive behavior, knowledge) and their relationships with adherence. The hypothesis that each facilitator to adherence would be positively related to adherence was confirmed. Participants' scores on each of the facilitators being addressed were found to be significantly positively correlated with their self-reported adherence, indicating that greater association with the facilitators was related to better adherence. These findings support past research which has found that increasing patient support, encouraging positive habits, and educating patients properly leads to increases in adherent behavior (Chong et al., 2011). Past research has also suggested that multifaceted approaches to

interventions and/or proactive therapy are the most successful approaches to take in improving patient adherence (Chong et al., 2011). Based on the current study's findings, it's important moving forward to consider ways in which college students can be encouraged to take charge in regard to their mental health, and practice positive health-related behaviors and routines. It's also evident that college students' knowledge about their disorders and treatments is related to their ability to properly adhere to said treatments.

This study's third research question concerned the prevalence of the addressed barriers to adherence between the participants as they were separated into three groups of minimal, moderate, and severe depression. It was hypothesized that the groups would score lowest to highest in the barrier's assessment in the following order: minimal, moderate, severe. This hypothesis was partially confirmed—statistically significant differences between the depression groups were found for the barriers “efficacy,” “problems taking medication,” and “forgetfulness.” but not for “side effects,” “access,” and “beliefs about medication.” Considering that side effects from medications and access to medications are variables that do not discriminate according to the severity of the disorders they are prescribed to treat, the lack of significant differences regarding these barriers between depression groups is not completely unexpected. The lack of significant differences between groups on “beliefs about medication” is more surprising. It is possible that college students' beliefs about medication are previously established and uninfluenced by the severity of their depression. Previous research, which has found positive correlations between depression and nonadherence (DiMatteo et al., 2000), led to the hypothesis that barriers to adherence would have increased presence in the more

depressed groups. Although the current study's findings only partially support previous research, it can still be concluded that more severely depressed college students are likely to have increased susceptibility to certain barriers. As previously discussed, depression has been shown to significantly impact rates of adherence (Grenard et al., 2011); in concordance with this past research, the findings in this study suggest that severity of depression is an important factor to consider when evaluating common barriers to adherence for college students.

The fourth research question addressed the prevalence of the addressed facilitators of adherence between the participants, again separated into three groups of minimal, moderate, and severe depression. It was hypothesized that the minimal, moderate, and severe groups would score highest, in the middle, and lowest on each of the facilitators of adherence assessments, respectively. For each of the three facilitators, "knowledge," "taking charge," and "positive behaviors," no significant differences were found between groups. It is possible that no significant differences were found in "taking charge" and "positive behaviors" because college students' willingness to take charge of their treatments, as well as their willingness to practice positive behaviors, are unrelated to the severity of their depression. Concerning "knowledge," while there were no significant differences found between groups, the result was approaching significance ($F(2,107) = 3.03, p = .053$). This result indicates that this study has no statistical evidence of a relationship between severity of depression and the facilitator to adherence "knowledge." However, previous research suggests severity of depression is related to patient's understanding of depression (Tomita et al., 2020), and other research has shown increases in adherence to be positively associated with patient education (Bambauer et al., 2007);

thus, it's important in future research to evaluate the potential relationship between severity of depression and patient knowledge of their disorder and treatment.

The fifth and final research question addressed the relationship between rates of adherence and severity of depression, again separating the participants into minimal, moderate, and severe groups based on their depressive symptoms. It was hypothesized that rates of adherence would be highest in the minimal group, then the moderate group, and that the severe group would score lowest. This hypothesis was mostly confirmed, with the minimal group scoring significantly higher than the moderate and severe groups; however, the moderate group did not score significantly higher than the severe group. Interestingly, these findings mirror the differences between the groups in their scores on the barriers to adherence. These findings support the well-established notion that more severe depression is negatively associated with adherence and may also challenge other aspects of life that require consistent attention (Tomita et al., 2020). According to these findings, we can conclude that college students' adherence to antidepressants is likely to suffer as the severity of their depression increases; considering this and that nonadherence to prescribed treatments leads to worsening conditions, college students with depressive disorders should have the severity of those disorders evaluated at regular intervals in order to prevent a downward spiral. Patients that are found to have worse or worsening depression should work with their healthcare provider in order to identify and combat barriers to their adherence that may become more present as the severity of their depression increases.

Limitations

The findings of this study are subject to discretion under several limitations that should be considered in any instance of their future use. The participants were a convenience sample of undergraduate psychology students at Texas State University, the majority of which were aged 18 to 21. Taking this into account, results from this study cannot be generalized beyond undergraduate students. Furthermore, the sample size of 113 would have ideally been above 200 to further increase the power of analyses. The subject pool recruited from was limited in size—only undergraduate psychology students were available, which, combined with the prerequisite of being prescribed antidepressants meant to treat a depressive disorder for a minimum of two months prior to participation resulted in fewer participants than desired. Unfortunately, the sample size was too small to control for potential differences between demographic groups. Of over 400 potential participants that opened the survey, only the 113 participants were able to complete the survey after answering the initial screening question.

In addition to limitations related to the samples, the methodology of measuring adherence used in this study is subject to bias. Self-report measures of adherence do not provide the same level of accuracy that objective measures would (Osterberg & Blaschke, 2005). Although self-report questionnaires are the most convenient and least expensive method of measuring adherence, they suffer from an inherent lack of reliability resulting from self-report bias (Luce et al., 2007). Future studies would benefit from combining self-report measures of adherence with objective measures, such as pill counts, tracking prescription refills, or electronic drug monitoring, to ensure more accurate results.

Internal reliability analysis, shown in Table 2, revealed several Cronbach's alpha levels in some of the scales that were lower than is considered ideal. In many cases, Cronbach's alpha levels would be above .7. In the current study, multiple scales with very few items were used. Increasing the number of items in the scales displaying less than desirable alpha levels would allow problematic items to be identified and either removed or corrected. Given the low alpha levels of multiple scales in this study, interpretation of the findings related to those scales should be conducted with caution.

Additionally, this study did not account for possible differences between antidepressants. It is possible that participants' results varied based on their specific prescribed medications. The results of this study did not account for differences between groups based on types of medications, amount of medications prescribed, or any other possible differences in the participants' treatment plans that may have related to their adherence. Furthermore, this study did not conduct analyses that considered the amount of time that participants had been prescribed and taking their medication(s). Although information regarding these factors was collected, they were ultimately not used in analyses of the proposed research questions.

Finally, this study did not account for participants that may have been undergoing a combination of medicinal and therapeutic treatment for their depression. Evidence of the benefits of talk therapy for depression suggests that it could be as effective as medication treatment; as this study did not assess whether patients were undergoing talk therapy in addition to their medication treatment, it could to determine how multiple therapeutic approaches may have been related to their adherence, barriers, and facilitators.

Implications and Future Research

The results of this study provide insight into antidepressant adherence in college students and factors that may be associated with adherence. The addressed barriers to adherence and facilitators of adherence shown to be statistically significant in their relationships with antidepressant adherence provide avenues for future research to build upon in search of specific factors that may be targeted in predicting and improving adherence. Furthermore, the findings relating to differences between groups based on severity of depression contribute to existing literature supporting the importance of patient-to-patient attention based on severity of depression; the best way to improve adherence to antidepressants in depressed patients is to tailor multifaceted treatments and use proactive health care based off specific patient's needs (Chong et al., 2011). In addition to the discussed barriers and facilitators to adherence, other factors, such as stress from comorbid disorders, denial, apathy, and more should be taken into account during treatment.

Future research should seek to further expand on the findings in this study through examinations of other possible underlying factors to adherence (e.g., comorbid disorders, denial, apathy toward treatment) as well as observing the significant barriers/facilitators and the possible influences of the barriers/facilitators more in-depth. Given the inconsistent nature from patient-to-patient of the underlying factors that result in lapses in adherence, it may be beneficial to pursue a deeper understanding of the ways in which adherent patients cope and the struggles that nonadherent patients suffer from through qualitative methods. This approach may also serve to alleviate an inherent difficulty in assessing the relationship and the underlying factors relevant between

depression and adherence; specifically, although a relationship between depression and adherence is apparent, no causal direction of that relationship can be assumed. Does worsening depression cause lapses in adherence, or do lapses in adherence cause worsening depression? If we assume both of the aforementioned hold true in different cases, establishing ways in which we may be able to predict and prevent underlying causes for each pathway is important. Multiple avenues toward this goal are feasible given the findings in this study; for example, following the findings concerned with severity of depression in relation to barriers and facilitators to adherence, interactions between severity of depression and specific covariates related to adherence shows potential for improving proactive care tailored to individual patients that may be more likely to struggle with specific barriers and/or facilitators to adherence. Ultimately, any research that builds on the knowledge of underlying factors that affect adherence in depressed patients should aim to educate healthcare providers on the critical factors to improve healthcare providers' abilities to provide effective treatment—this study has identified multiple factors that require further attention in order to achieve that goal. The findings of this study suggest healthcare providers should look to evaluate and provide solutions when necessary in regard to their patients' efficacy toward their treatment(s), tolerability toward side effects, potential issues with taking medication(s) (e.g., lifestyle, pill size), potential to forget how or when to take their medication(s), inability to access their needed medication(s), and any negative beliefs toward medication. Healthcare providers should also encourage their patients to take charge of their treatments by making decisions collaboratively with them, and providers should encourage their patients to practice positive behaviors (e.g., healthy routines that incorporate consistency

in their adherence). Furthermore, researchers and healthcare providers alike should constantly aim to improve knowledge surrounding depression, treatments for depression, and ways to both cope and seek help. In regard to college students, future research should take the findings presented in this study as a basis for future research. It has been shown that adherence to antidepressants in college students is heavily impacted by a variety of barriers and facilitators to adherence, as well as by the severity of the depressive disorders that they suffer from. More than anything, the present study's findings demonstrate that there are ways in which adherence to antidepressants in college students can be predicted and improved. Through careful evaluation of common barriers and facilitators to adherence associated with antidepressant adherence in college students as they are relevant on a patient-to-patient basis, healthcare providers can better tailor therapeutic interventions and preventative measures to improve adherence.

APPENDIX SECTION

Table 1. *Sample Characteristics*

Variable	<i>n</i> (%)
Gender	
Male	25 (22.1)
Female	86 (76.1)
Other	2 (1.8)
Ethnicity	
Asian/Asian American	4 (3.5)
African/African American	16 (14.2)
Caucasian	56 (49.6)
Hispanic/Latino	28 (24.9)
Other	8 (7.1)
Age	
18	27 (23.9)
19	49 (43.4)
20	14 (12.4)
21+	21 (18.6)
Depression	
Minimal	19 (16.8)
Moderate	50 (44.2)
Severe	43 (38.1)

Table 2. Scale Reliability and Descriptive Statistics

Scale	N	Cronbach's			SD	Minimum	Maximum
		Alpha	Items	M			
Efficacy	111	.66	4	11.09	3.45	4	20
Side Effects	112	.51	2	6.04	1.91	2	10
Problems taking medication	112	.83	3	7.96	3.44	3	15
Forgetfulness	111	.62	2	5.64	2.19	2	10
Access	111	.54	3	7.72	2.94	3	15
Beliefs about medication(s)	111	.84	8	27.25	6.51	10	40
Taking charge	112	.68	4	17.34	1.86	13	20
Positive behaviors	110	.37	6	25.85	2.02	18	30
Knowledge	110	.56	3	12.74	1.57	9	15
Adherence (MARS)	110	.55	10	14.75	2.09	10	19
Depression	112	.88	9	11.92	6.36	0	24

Table 3. *Correlations Between Adherence and Barriers to Adherence*

Variable	Adherence (MARS)
Efficacy	-.37**
Side Effects	-.32**
Problems taking medication	-.51**
Forgetfulness	-.45**
Access	-.29**
Beliefs about medication	-.41**

Note. Sample includes all participants that completed related items ($n = 109$). * $p < .05$. ** $p < .01$.

Table 4. *Correlations Between Adherence and Facilitators of Adherence*

Variable	Adherence (MARS)
Taking charge	.24*
Positive behaviors	.30**
Knowledge	.29**

Note. Sample includes all participants that fully completed related items ($n=109$). * $p < .05$. ** $p < .01$.

Table 5a. Means, Standard Deviations, and One-Way Analyses of Variance in Severity of Depression and Barriers to Adherence

Measure	Minimal		Moderate		Severe		F	Sig.
	M	SD	M	SD	M	SD		
Efficacy	9.22	3.86	10.84	3.02	12.16	3.43	5.21	.007
Side Effects	5.68	2.24	5.72	1.69	6.58	1.93	2.84	.063
Problems taking medication	5.63	2.24	7.94	3.32	9.02	3.25	7.12	.001
Forgetfulness	4.58	2.14	5.48	2.11	6.31	2.12	4.61	.012
Access	7.11	3.78	7.54	2.60	8.21	2.89	1.10	.336
Beliefs about medication	29.26	6.69	27.10	6.02	26.52	1.07	1.19	.309

Table 5b. *Tukey HSD Comparisons Between Severity of Depression and Barriers to Adherence*

			Mean	
			Difference	Significance
Efficacy				
Minimal	Moderate		-1.61	.184
	Severe		-2.94	.006
Moderate	Severe		-1.32	.140
Side Effects				
Minimal	Moderate		-0.04	.997
	Severe		-0.89	.199
Moderate	Severe		-0.86	.076
Problems taking medication				
Minimal	Moderate		-2.31	.027
	Severe		-3.39	.001
Moderate	Severe		-1.08	.252
Forgetfulness				
Minimal	Moderate		-0.90	.260
	Severe		-1.73	.011
Moderate	Severe		-0.83	.153
Access				
Minimal	Moderate		-0.43	.847
	Severe		-1.11	.363
Moderate	Severe		-0.67	.519
Beliefs about medication				
Minimal	Moderate		2.16	.435
	Severe		2.74	.284
Moderate	Severe		0.58	.906

Table 6a. Means, Standard Deviations, and One-Way Analyses of Variance in Severity of Depression and Facilitators of Adherence

Measure	Minimal		Moderate		Severe		F	Sig.
	M	SD	M	SD	M	SD		
Taking charge	18	1.83	17.20	1.87	17.21	1.85	1.45	.239
Positive behaviors	26.21	2.07	25.53	1.68	26.07	2.33	1.17	.315
Knowledge	13.47	1.50	12.70	1.52	12.46	1.45	3.03	.053

Table 6b. *Tukey HSD Comparisons Between Severity of Depression and Facilitators of Adherence*

			Mean	
			Difference	Significance
Taking charge	Minimal	Moderate	0.80	.250
		Severe	0.79	.273
	Moderate	Severe	-0.01	.990
Positive behaviors	Minimal	Moderate	0.68	.429
		Severe	0.14	.966
	Moderate	Severe	-0.54	.413
Knowledge	Minimal	Moderate	0.77	.136
		Severe	1.01	.042
	Moderate	Severe	0.24	.732

Table 7a. Means, Standard Deviations, and One-Way Analyses of Variance in Severity of Depression and Adherence

Measure	Minimal		Moderate		Severe		F	Sig.
	M	SD	M	SD	M	SD		
Adherence (MARS)	16.39	1.61	14.52	1.96	14.31	2.14	7.45	.001

Table 7b. *Tukey HSD Comparisons Between Severity of Depression and Adherence*

		Mean	
		Difference	Significance
Adherence			
Minimal	Moderate	1.87	.003
	Severe	2.07	.001
Moderate	Severe	0.20	.878

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