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Psychological Trauma, Substance Use and Mood Disorders and Level of Distress among Impaired Professionals: A Mediating Model of Comorbidity

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Abstract

The prevalence of co-occurring psychiatric and substance use disorders is well established, yet, inadequately understood. Individuals with co-occurring psychiatric and substance use disorders display complex clinical presentations have poor prognosis, and institutional barriers hinder them from receiving treatment. To clarify our understanding of this common, yet complex, clinical presentation, we test the hypothesis that substance use disorder symptoms, mood disorders, and psychological trauma symptoms directly contribute to patient distress.

Material and methods

Between January 2006 and June 2010, participants were evaluated and treated in an outpatient setting on a health sciences center campus in Oklahoma City by the Department of Psychiatry and Behavioral Sciences. All participants were impaired professionals. Two groups of professionals participated: 1) health care providers (N=96) and 2) non-healthcare providers (N=44). We applied Structural Equation Modeling (SEM) techniques to the analysis.

Results

Mood disorder, substance use disorder, and trauma symptoms were all positively related to the level of distress. Symptoms of mood disorders had a total direct effect of 0.51 (p<0.0001) on level of distress. Trauma symptoms had a total effect of 0.46 (p<0.0001) on level of distress. This total effect includes 0.18 (p=0.05) direct effect on level of distress and 0.28 (p<0.0001) indirect effect through mood disorder symptoms leading to level of distress. Thus, mood disorder symptoms mediated the relationship between trauma symptoms and level of distress symptoms. The strongest positive direct paths were from symptoms of trauma to mood disorders, with a coefficient of 0.55, and from symptoms of mood disorders to level of distress, with a coefficient of 0.51.

Discussion

This approach challenges the existing treatment models, which targets diagnostic categories with prescribed treatment programs and regimens that may require abstinence before addressing trauma and mood symptoms. The effect of comorbid symptoms on patients' levels of distress is more complicated than existing models of co-occurring typologies or treatment approaches would indicate. The results have clinical implications and contribute to advancing the fields' current understanding of the relationship between co-occurring substance use disorders, mood disorders, posttraumatic stress disorder, and patients' levels of distress, thereby improving treatment outcomes

Keywords

Trauma; Substance use disorder; Structural Equation Modeling (SEM); Mediation; Impaired professionals; Comorbidity

Introduction

The prevalence of co-occurring psychiatric and substance use disorders is well established [1,2]. Although it is well-established, this relationship is not fully appreciated [3-5]. Thus, the treatment of this combination of disorders continues to be a vexing clinical problem encountered by most mental health and substance abuse treatment providers [3,6-10]. Individuals with co-occurring psychiatric and substance use disorders display more complex clinical presentations [5,9]. They have greater psychosocial problems, and, subsequently, poor prognosis [11-13]. Institutional barriers hinder patients with co-occurring disorders from receiving the treatment they need [9].

Recent studies indicated that individuals presenting with co-occurring psychiatric and substance use disorders share a common cluster of symptoms [14,15]. Clinicians then struggle with the dilemma of choosing which disorder to treat first. An early approach to solving this dilemma involved attempting to classify types of co-occurring disorders into two main typologies. The first classification describes four variations of co-occurring disorders: 1) secondary psychopathology, 2) secondary substance abuse, 3) common factor, and 4) bidirectional [8]. The second typology identifies three types of co-occurring disorders; 1) type one, primary mental health problems with substances used to medicate the mental health problems, 2) type two, primary substance use disorder with substance-induced mental health problems, and 3) type three, co-existing mental health and substance use disorders.

More recently, researchers have investigated the structure/clustering of symptoms and disorders across patients [16-18]. Other groups have examined shared variance across symptoms and disorders that are taken into account in an outcome or criterion variable [14]. Providers often encounter the presence of co-occurring posttraumatic stress disorder, substance use, and mood disorders [11,19-21].

To help clarify our understanding of this common, yet complex, clinical presentation, our objective is to conduct a secondary data analysis of information from patients with co-occurring substance use and mood disorders with trauma symptoms. We used measures taken from standardized, psychometric, diagnostic testing, and applied Structural Equation Modeling (SEM) techniques to the analysis. We extended our previous research regarding the comorbidity of substance use, mood, and trauma disorder symptoms expressed by impaired professionals and their corresponding levels of distress by

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developing and testing a diagram of symptom effects. We anticipate that the results will help researchers and clinicians refine their thinking regarding the categories used to describe patients with co-occurring disorders. We also hope that the results will have clinical implications and contribute to advancing the fields' current understanding of the relationship between co-occurring substance use disorders, mood disorders, posttraumatic stress disorder, and patients' levels of distress, thereby improving treatment outcomes.

In his 1950's book entitled *Method in the Physical Sciences*, von Neumann explains the use of models:

The sciences do not try to explain, they hardly even try to interpret, and they mainly make models. By a model is meant a mathematical construct which, with the addition of certain verbal interpretations, describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work-that is, correctly to describe phenomena from a reasonably wide area [22].

Structural equation modeling (SEM) is a theory-driven analytical tool that allows researchers to evaluate *a priori* hypothesized causal relationships between measured, observable variables and latent, conceptual variables [23]. SEM programs analyze hypothesized covariance structures, specifying the relationship between variables and the variables' fit with the data's original covariance matrix [24]. This approach is based on multiple linear regressions, which constructs a model consisting of an outcome variable and multiple predictor variables, resulting in a unique path diagram that predicts the criterion variable [23]. In addition, SEM is a Confirmatory Factor Analysis (CFA) tool that estimates the quality of measurement [25]. The SEM approach can be used in several ways; in the present study, SEM was used to generate a model that statistically fits the data well and is theoretically justifiable [26]. Specifically, this analysis sought to determine whether substance use disorder symptoms, mood disorder symptoms, and symptoms of psychological trauma directly predicted participants' current levels of distress, or if mood disorder symptoms and/or symptoms of psychological trauma mediated the effects of substance use disorder symptoms on participants' current levels of distress.

Material and Methods

Participants

Participants were evaluated and treated in an outpatient setting on a health sciences center campus by the Department of Psychiatry and Behavioral Sciences in Oklahoma City. Participants were referred for evaluation by family friends and family members, employers, professional advocacy groups, or licensure boards in the state of Oklahoma (additional details) [27]. All participants were professionals confronted with difficulty at the workplace, such that it impaired their day-to-day work performance. They were evaluated between January 2006 and June 2010. Two groups of professionals participated: 1) health care providers and 2) non-healthcare providers. The healthcare provider participants (N=96) included medical doctors, nurses, dentists, and optometrists. The non-healthcare participant group (N=44) included business executives, lawyers, professors, and other professionals with advanced degrees and professional certifications (i.e., Certified Public Accountants). The prevalence of co-occurring disorders among impaired professionals is reported to be similar to that found in the general population [27,28]. The study was approved by the University of Oklahoma Health Sciences Center Institutional Review Board.

Procedures

All participants completed a clinical interview, a standard clinic questionnaire designed to capture biopsychosocial information, and the Personality Assessment Inventory (PAI). For the present study, the PAI data were used to test the hypothesis that substance use disorder symptoms, depression and anxiety, and psychological trauma symptoms significantly contribute to patient distress. The PAI is a self-administered objective test of personality and psychopathology designed to provide information on an individual's level of functioning in a variety of domains. This measure is comprised of 344 items written at a fourth grade reading-level and is intended for use by those aged 18 and older. It takes 40 to 50 minutes to complete. The PAI was developed for use with clinical populations and was validated with a census-matched, normal population, a college student sample, and a clinical sample. Participants completed the computer-administered version of the PAI after receiving brief instructions [29].

Measurement

To test the hypothesis that substance use disorder symptoms, depression and anxiety, and psychological trauma symptoms directly contribute to patient distress, an SEM model was created. The model consisted of two latent factors: Addiction and Psychiatric Illness. Addiction was composed of two PAI scales derived from the PAI scales for Alcohol Problems and Drug Problems. The PAI Alcohol Problems scale (12 items) pertains to behaviors and effects of alcohol use, abuse, dependence, consequences of drinking, loss of control, and alcohol-related craving. The PAI Drug Problems scale (12 items) pertains to behaviors and effects of drug abuse, craving, loss of control, and consequences of drug use.

Psychiatric Illness is composed of two PAI scales. The PAI Depression scale (24 items) measures common cognitive, affective, and physiological symptoms of depression, while the Anxiety scale (24 items) assesses common clinical cognitive, affective, and physiological domains of anxiety.

Trauma was measured using the PAI Traumatic Stress subscale (4 items). This subscale identifies whether an individual has experienced a disturbing traumatic event that continues to cause clinical distress for that individual. The PAI traumatic Stress subscale is not specific to the type of traumatic event (i.e., sexual assault, natural disaster, motor vehicle accident, or combat).

The criterion or outcome variable was the score on the PAI Global Distress scale (12 items). The Global Distress scale captures an individual's recent and current stressors, which may include family problems, finances, work-related difficulties, or other major life changes.

Statistical Analysis

Structural equation modeling (SEM) with latent variables was used to analyze the association among symptoms of mood disorders, substance use disorders, trauma, and level of distress. Different SEM models were generated, and the models' fit were compared. The direct and indirect effect with the path coefficient was also tested on the final model. The analysis was conducted in SAS 9.4, with an alpha significance level of 0.05 [30].

Results

Across the different SEM path analysis, we observed no significant direct effect from substance use disorder on distress level. After

adjusting the model for mediating effects, we constructed a final SEM model. Figure 1 displays the path diagram with the standardized regression coefficients for the effect of the paths in the final model. A significant path effect was indicated by an asterisk. This model fits the data well (GFI =0.98; ^{2}=7.03; *df*=6, *p*-value=0.32; RMSEA=0.04; Bentler Comparative Fit Index=0.10).

Mood disorder, substance use disorder, and trauma symptoms were all positively related to the level of distress. Symptoms of mood disorders had a total direct effect of 0.51 (p<0.0001) on level of distress. This coefficient indicates that there was an increase of 0.51 standard deviation in the level of distress; T-score for each increase of 1 standard deviation in mood disorder symptoms. Trauma symptoms had a total effect of 0.46 (p<0.0001) on level of distress. This total effect includes 0.18 (p=0.05) direct effect on level of distress and 0.28 (p<0.0001) indirect effect through mood disorder symptoms leading to level of distress. Thus, mood disorder symptoms mediated the relationship between trauma symptoms and level of distress symptoms. Substance use disorder symptoms had no significant direct effect on level of distress. However, symptoms of substance use disorders had a significant total indirect effect of 0.28 (p=0.0002) on level of distress. Thus, mood disorder and trauma symptoms mediated the relationship between substance use disorder and level of distress symptoms.

The strongest positive direct paths were from symptoms of trauma to mood disorders, with a coefficient of 0.55, and from symptoms of mood disorders to level of distress, with a coefficient of 0.51. Table 1 shows the R^2 values for the endogenous variables. Symptoms of mood disorders, trauma, and substance use disorders accounted for about 41% of the variance in level of distress. Substance use disorder and trauma symptoms accounted for about 48% of the variance in mood disorder symptoms. Substance use disorder symptoms accounted for about 7.5% of the variance in trauma symptoms.

Discussion

The present study presents a mathematically justified representation of the interaction of substance use, mood, and trauma disorder symptoms, which provides an empirically derived model describing the phenomena of comorbidity among a group of impaired professionals undergoing integrated substance use disorder and psychiatric outpatient treatment. We observed that the symptoms of substance use disorders make a significant, yet indirect, contribution to patients' perceived levels of distress. Mood disorder and trauma symptoms had a direct effect on patients' levels of distress. Thus, the model empirically supports the mediating effect of mood and trauma disorder symptoms on substance use disorder symptoms and patients' levels of distress.

The model demonstrates that an increase in mood disorder and trauma symptoms is predicted by an increase in substance use disorder symptoms. However, it is the mood disorder symptoms primarily predict the patients' levels of distress. The model describes a "confluence of symptoms" that predict level of distress. The word confluence is used to describe the merging of two or more bodies of water [31]. The model captures the complicated phenomenon of "symptom confluence", depicting the avenues through which substance use, mood, and trauma symptoms merge to influence these patients' levels of distress.

The prevailing typologies of co-occurring disorders appear to be too simplistic to adequately account for the relationships that the proposed model empirically represents [32]. The clinical presentation depicted by our SEM model suggests more than simply a mental health problem that is medicated through the use of substances, a mental health problem that is induced by substance use. While the current body of research establishes the correlation between substance use, mood disorders, and trauma, the present study proposes the

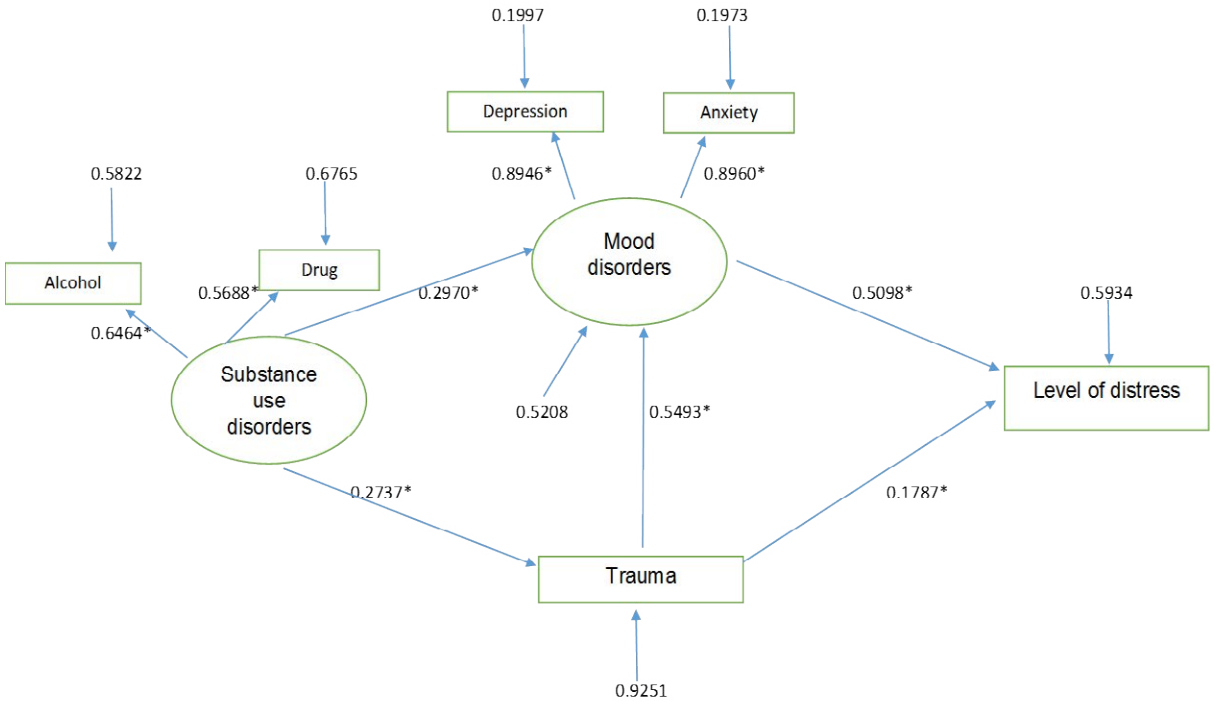

Figure 1: Path diagram of SEM of trauma, substance abuse, and psychiatric comorbidity on impaired professionals' level of distress.

Table 1: Results of SEM of trauma, substance abuse, and psychiatric comorbidity on impaired professionals' level of distress.

Variable	R-Square
Level of Distress Symptoms	0.41
Alcohol Disorder Symptoms	0.42
Drug Use Disorder Symptoms	0.32
Depression Symptoms	0.80
Anxiety Symptoms	0.80
Trauma Symptoms	0.07
Mood Disorder Symptoms	0.48

avenues through which the symptoms of these disorders influence these patients' levels of distress, revealing a much richer and more complicated picture than the existing typologies would indicate. By their very nature, the existing typologies lead researchers and clinicians to approach the problem of comorbidity as a "chicken or the egg" problem; which to treat first? Our proposed model suggests that the important question is how the symptoms of these various disorders come together to affect patients' levels of distress and create life problems.

From a clinical perspective, the model challenges the common assumption that one must be free of all substance use before they can address their psychological trauma. Rather, helping the patient understand how the various symptoms contribute to their current level of distress and life problems may be a more beneficial approach than deciding which disorder to treat first. Here we propose "symptom mapping", that is, allocating or mapping symptoms of the patient's co-occurring disorders to their level of distress and life problems. As the proposed model indicates, substance use, mood disorders, and trauma uniquely and differentially impact patients' levels of distress. Mapping specific symptoms to identified problems, such as family difficulties, finances, work-related problems, or other major life changes, allows clinicians and patients to identify how the symptoms of these disorders create their distress and then target interventions to either decrease symptoms or alleviate problems. This approach challenges the existing treatment model, which tends to target diagnostic categories with prescribed treatment programs and regimens. As the proposed model indicates, the effect of comorbid symptoms on patients' levels of distress is more complicated than existing models of co-occurring typologies or treatment approaches would indicate.

While a number of researchers in the field of modeling research have reached similar conclusions, additional work is needed to replicate these findings with larger samples [14,15,18]. This type of modeling research and confirmatory factor analysis should be replicated with the general population using different types of indicators forming the same latent variables: substance use, mood disorders, and trauma. Finally, symptom-specific research that identifies how specific symptoms of the various co-occurring disorders contribute to patients' problems and levels of distress is warranted.

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