



Gender, Maltreatment and Psychiatric Symptoms Among Adolescents in Outpatient Substance Abuse Treatment

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Abstract

Childhood maltreatment experiences are risk factors for externalizing and internalizing symptoms, as well as substance abuse problems during adolescence. In the present study, we administered structured interviews to 394 adolescents receiving outpatient substance abuse treatment services (280 males; $M_{\text{years}} = 16.33$; $SD_{\text{years}} = 1.15$). K-means cluster analysis was used to examine: (a) the co-patterning of childhood maltreatment experiences and past-year externalizing symptoms (for drug and alcohol abuse and dependence, conduct disorder); (b) between-cluster differences in serious internalizing problems (for past-year anxiety and depression symptoms and current distress); and (c) gender differences in these relations. Both similarities and differences were identified in maltreatment-externalizing behavior patterns and relations with serious internalizing problems across gender groups. Childhood maltreatment and subsequent psychopathology have implications for the adaptation and delivery of substance abuse treatment services to boys and girls to improve their engagement and treatment outcomes.

Keywords Maltreatment · Externalizing · Internalizing · Adolescence · Substance abuse · Cluster analysis

Exploratory risk behaviors such as alcohol and other drug (AOD) use are normative during adolescence, when problem use patterns first emerge (Arnett, 2005; Coley, Votruba-Drzal, & Schindler, 2008). Early problem patterns of substance use significantly increase the probability of long-term maladaptive outcomes, including substance use disorders (SUDs) and criminal justice system involvement (Clark, Jones, Wood, & Cornelius, 2006; Ellickson, Tucker, & Klein, 2003). Adolescents reporting SUDs or receiving substance abuse treatment services often report comorbid internalizing and externalizing disorder symptoms (Chan, Dennis & Funk, 2008; Conway, Swendsen, Husky, He, & Merikangas, 2016). Childhood psychological maltreatment is a shared risk factor for both externalizing (substance abuse, conduct problems) and internalizing (anxiety, depression) problems, and is associated with co-occurring psychiatric symptoms among adolescents (Cicchetti, 2016; Kim & Cicchetti, 2010). Documentation of heterogeneous patterns of childhood maltreatment, SUD and other psychiatric disorder symptoms can inform efforts to tailor substance abuse

treatment services for adolescents. The present study: (a) developed descriptive profiles of maltreatment experiences and externalizing disorder symptoms among adolescents receiving outpatient substance abuse treatment services, (b) examined relations between profile membership and internalizing disorder symptoms, and (c) documented similarities and differences in the experiences of boys and girls. The overarching goal of this study was to generate suggestions for tailoring outpatient substance abuse treatment services to meet the needs of specific subgroups of boys and girls.

Maltreatment, Substance Abuse and Co-Occurring Psychopathology

In substance abuse treatment service delivery settings, social work professionals often counsel adolescent clients who struggle to manage both symptoms of their substance use problems and comorbid internalizing and externalizing disorders, including conduct disorder (CD); attention deficit/hyperactivity disorder (ADHD), as well as forms of anxiety and depression (Galvani, 2015). In substance abuse treatment planning and implementation, co-occurring SUDs, internalizing and externalizing disorders are a substantial challenge to client engagement and retention due to common

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features including high impulsivity, poor decision-making, impaired coping skills and cognitive impairments (Adan, Antunez, & Navarro, 2017; Marín-Navarrete et al., 2018; Storr, Pacek, & Martins, 2012). In addition to shared individual-level risk factors, substance use, internalizing and externalizing disorders share contextual risk factors in developmental processes that lead to the onset and maintenance of each disorder and their co-occurrence (Sabri, 2012). Early childhood adversities, such as childhood maltreatment, initiate maladaptive developmental pathways that promote internalizing, externalizing and substance use problems, but may vary for boys and girls (Benedini & Fagan, 2018; Cicchetti & Handley, 2019).

Childhood maltreatment includes experiences of early adversities such as physical, sexual or emotional abuse, physical or emotional neglect or pervasively negative or unsafe home environments. These adversities are associated with poverty and disproportionately impact children who are members of minority groups residing in low socioeconomic communities (Jonson-Reid, Drake, & Zhou, 2013; McLeigh, McDonnell, & Lavenda, 2018). Childhood maltreatment experiences are complex, varying by the types of maltreatment or combinations experienced (i.e., extensiveness), severity, timing of onset and chronicity (e.g., Greenfield, 2010). The impact of early abuse and neglect on neurological structures and their behavioral correlates, including emotional dysregulation and reactivity, aggression and impulse control, may set into motion developmental cascades that promote internalizing and externalizing behaviors, as well as substance use problems (Burrus, 2013; McLaughlin, Sheridan, & Lambert, 2014). Documentation of individual differences in patterns of childhood maltreatment experiences may provide important information about early adversities that influence (a) co-occurring internalizing and externalizing psychopathology reported by adolescents receiving substance abuse treatment services and (b) differences in how subgroups of adolescents may engage in substance abuse treatment (e.g., Putnam, Harris, & Putnam, 2013).

Childhood maltreatment is experienced by children as pervasive threats or deprivation and is associated with neurological changes linked to both internalizing and externalizing behaviors, including depression, anxiety and CD symptoms (Gerin et al., 2019; Gold et al., 2016; McLaughlin et al., 2014). For example, harsh, negative parenting practices and the experience of family violence are robust predictors of children's and adolescents' expressions of aggression and violence (Breslend et al., 2016; Labella & Masten, 2018). In addition to neurological adaptations to maltreatment exposure, correlates such as emotional regulation, social-cognitive biases or executive functioning deficits may function as powerful, but potentially modifiable mediators in paths of influence to later internalizing or externalizing problems (Heleniak, Jenness, Vander Stoep, McCauley,

& McLaughlin, 2015; Horn, Roos, Beauchamp, Flannery, & Fisher, 2018; Jaffee, 2017; Tang, Deng, Du, & Wang, 2018). Multi-level developmental systems perspectives conceptualize robust paths from early maltreatment experiences to externalizing problems and conduct disorder, as well as to internalizing problems, and extend those paths to include greater likelihood for substance use problems and disorders (Cicchetti & Handley, 2019).

Forms of childhood maltreatment, through internalizing and externalizing pathways, have significant predictive relations with substance use initiation, acceleration of use, and dependence in adolescent populations (Chen, Drabick, & Burgers, 2014; Evans, Spirito, Celio, Dyl, & Hunt, 2007; Handley, Rogosch, & Cicchetti, 2017; Hudson et al., 2017; Perkins & Jones, 2004). Robust relations between externalizing behaviors and substance abuse can be understood in multiple ways, e.g., through (a) common pathways to each outcome or (b) longitudinal reciprocal influences (Jun, Sacco, Bright, & Camlin, 2015; Keyes et al., 2012). Similarly, emerging evidence suggests multiple potential paths from maltreatment to internalizing problems and substance abuse through negative emotionality, emotional dysregulation or altered stress responses (Cicchetti & Handley, 2019).

Longitudinal models document stronger predictive relations between adolescents' externalizing behaviors and subsequent onset and acceleration of substance use problems, compared to the potential role of co-existing internalizing problems, which appear to have a protective effect (Colder et al., 2018; Farmer et al., 2016). Nonetheless, internalizing disorders are highly comorbid with substance use disorders among adolescents receiving substance abuse treatment services (Baumer, Dennis, & Estrada, 2018; Chan et al., 2008). There is a significant relation between childhood maltreatment experiences, in particular in family contexts, and the subsequent development of internalizing problems during adolescence, in part through emotional dysregulation and greater growth in longitudinal distress trajectories (Dion et al., 2016; Heleniak et al., 2015). The construct of psychological distress consists of indicators assessing feelings of depression, anxiety and suicidality (Arbour-Nicitopoulos, Faulkner, & Irving, 2012). Distress can be both a risk factor for, and a consequence of, substance use and externalizing behaviors, with high levels reported by adolescent polysubstance users (Kelly, Chan, Mason, & Williams, 2015).

Gender Differences Among Maltreatment and Internalizing and Externalizing Symptoms

Childhood maltreatment is a significant risk factor for the development of substance use disorders among adolescents (Widom, Schuck, & White, 2006). Gender differences in

prevalence rates of specific forms of childhood maltreatment, and in adolescents' experiences of, and responses to childhood maltreatment may promote gender differences in relations between childhood maltreatment and later substance use outcomes (Hudson et al., 2017; Widom, Marmorstein, & White, 2006; Wilson & Widom, 2008). For example, one study found that gender moderated early mediated paths (via anger) between childhood abuse and neglect to substance use severity (Kobulsky, Yoon, Bright, Lee, & Nam, 2018). In contrast, other studies have found no gender differences in relations among childhood maltreatment, internalizing problems and substance use in adolescence (e.g., Herrera & Stuewig, 2017). The degree to which gender moderates relations among maltreatment, internalizing and externalizing problems, and substance use severity is an area of active research inquiry (Cicchetti & Handley, 2019), with important implications for the tailoring and delivery of substance abuse prevention and treatment services to adolescents.

Based on literatures related to gender differences in maltreatment experiences and externalizing problems, we expected to identify distinctly different patterns of maltreatment experiences and externalizing behaviors by gender. For example, girls typically report significantly higher rates of sexual abuse while boys report more physical abuse and punishment experiences (Norman et al., 2012). In addition, girls, at substance abuse treatment entry, typically present more severe symptoms both in terms of substance use and externalizing behaviors (Green, Polen, Dickinson, Lynch, & Bennett, 2002). We also expected that scores for overall distress, anxiety disorder symptoms, and affective disorder symptoms to be significantly associated with cluster membership and to vary systematically by gender, with girls reporting higher scores for internalizing problems than boys (Couwenbergh et al., 2006). Although both boys and girls report symptoms of internalizing problems, distress, and suicidality, girls report such problems at significantly higher rates during adolescence (Lau & Eley, 2008). Gender differences in self-reported distress may be the result of gender differences in childhood adversities and subsequent patterns of substance use and co-occurring mental health problems (Fothergill, Ensminger, Doherty, Juon, & Green, 2016). Clusters reporting the most extensive patterns of childhood maltreatment should also report the highest scores for serious internalizing problems.

The Current Study

The first goal of the present study was to construct unique and non-overlapping profiles of adolescents defined by childhood maltreatment experiences and past-year externalizing disorder symptoms, using cluster analyses of data collected from a sample of adolescents receiving

outpatient substance abuse treatment services, and to document differences in the typologies generated for boys and girls. A second goal was to identify between-profile differences in serious past-year internalizing problems for both boys and girls. This second set of between-profile comparisons was intended to: (a) validate the cluster solutions for boys and girls, but also to (b) identify subgroups of boys and girls who may experience outpatient substance abuse treatment services differently due to systematic differences in serious internalizing problems. Identification of homogenous subgroups of adolescents reporting specific patterns of childhood maltreatment, substance use and psychopathology may advance efforts to tailor substance abuse treatment planning and implementation, as well as selective prevention programs for high-risk adolescents who experience multiple childhood adversities (e.g., Santucci, 2012).

Methods

The present study used data collected in a longitudinal evaluation funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) of a brief motivational intervention (BMI) for Human Immunodeficiency Virus (HIV) and sexually transmitted infection (STI) risk reduction among adolescents with substance abuse problems receiving outpatient substance abuse treatment services in Miami-Dade and Broward Counties, Florida. Variables used in analyses were derived from baseline surveys in the larger evaluation study.

Participants

The present study included an ethnically diverse sample of 394 adolescents receiving substance abuse treatment services in two outpatient substance abuse treatment facilities in South Florida. Participants included 280 (71.1%) males and 114 (28.9%) females ranging from 12 to 18 years of age ($M = 16.33$, $SD = 1.15$). The sample included 100 (25.4%) non-Hispanic White, 177 (44.9%) Hispanic, 81 (20.6%) African-American and 36 (9.1%) adolescents from other racial/ethnic groups. A majority of the participants ($n = 295$, 74.8%) reported their mother, their father, or both parents as their primary caregivers. More than half of the sample ($n = 208$, 51.7%) reported repeating at least one grade. In the NIAAA-funded evaluation study, inclusion criteria included sexual activity during the previous 6 months, written child assent and written parental consent. Exclusion criteria included cognitive deficits or developmental delays (as reported by case managers) or current physical danger due to suicidality.

Measures

DSM-IV Psychiatric Symptoms

Lifetime and past year psychiatric symptoms were assessed using the Brief Michigan version of the Composite International Diagnostic Interview (UM-CIDI; Gigantesco & Morosini, 2008). The UM-CIDI is fully structured comprehensive diagnostic interview designed to assess psychiatric disorders using criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; APA, 2000). Each module of the CIDI used computerized delivery of items and allowed for skip patterns so that only participants meeting initial criteria for specific disorders would be asked all of the relevant items for a module, to reduce client burden. In the NIAAA-funded evaluation study, this measure was used to assess psychiatric disorders relevant to adolescents in outpatient substance abuse treatment including: conduct disorder, alcohol and drug abuse and dependence disorders, as well as anxiety and affective disorders. The CIDI was developed to help standardize the assessment of psychological disorders in community or field settings and has strong interrater and test–retest reliability, and validity (Gigantesco & Morosini, 2008).

Childhood Maltreatment Experiences

Childhood maltreatment experiences were assessed using the Child Abuse and Trauma Scale (CATS; Sanders & Becker-Lausen, 1995). This 38-item self-report inventory is used to measure specific maltreatment experiences and their degree of extensiveness and severity during childhood and adolescence. The CATS consists of three subscales with dedicated items: Neglect/Negative Home Environment (14 items, $\alpha = .87$), Punishment (6 items, $\alpha = .65$), and Sexual Abuse (6 items, $\alpha = .74$). Each item uses Likert-type ratings ranging from “never (1)” to “always (5)”. Several of these items are reverse coded. The CATS demonstrates strong test–retest reliability and high internal validity and consistency, as well as strong convergent validity with other well-established abuse and neglect measures (Higgins & McCabe, 2001). Some sample CATS items include “Did you ever think seriously about running away from home?” or “As a child did you feel unwanted or emotionally neglected?” (Neglect/Negative Home Environment); “Did your parents ever hit or beat you when you did not expect it?” or “When you did not follow the rule of the house, how often were you severely punished?” (Punishment); and “Have you ever experienced sexual abuse?” or “Before you were 14, did you engage in any sexual activity with an adult?” (Sexual Abuse).

Psychological Distress

Feelings of distress and suicidal ideation were assessed using 5 items ($\alpha = .77$) from the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979). Items for this construct were rated on a Likert-like scale that ranged from “(1) Not a lot” to “(4) Much more than usual”. The five items asked participants how often they: “felt that life is not worth living,” “thought about doing away with yourself,” “could not do anything because your nerves were too bad,” “wishing you were dead and away from it all,” and “idea of taking your life kept coming into your head.” These items were used to help determine the level of overall distress experienced by each participant.

Procedure

Adolescent clients were invited to participate in the larger HIV/STI risk reduction intervention study within 1 week of enrollment in substance abuse treatment services. After being read eligibility criteria and affirming interest in participation, adolescents were invited to contact a project staff member to confirm eligibility. Participants completed a 60- to 90-minute computer-assisted, laptop-based semi-structured interview focused on variable domains including substance use, sexual risk behaviors, internalizing and externalizing behaviors, home environment, demographic information, and potential mediators and moderators of intervention impact. Trained graduate students facilitated data collection at each outpatient substance abuse treatment site. Participants were compensated with \$25.00 upon completing their interviews.

Analytic Plan

K-means cluster analysis was implemented using SPSS Statistics 24 to create unique and non-overlapping groupings of adolescents from this outpatient substance abuse treatment sample (Mun, von Eye, Bates, & Vaschillo, 2008; von Eye & Bogat, 2006). Six different measures were used as standardized component variables to create maltreatment-externalizing behavior typologies separately by gender: (1) the mean CATS sexual abuse score, (2) the mean CATS punishment score, (3) the mean CATS neglect/negative home environment score, (4) a count measure of UM-CIDI alcohol abuse or dependence symptoms, (5) a count measure of UM-CIDI drug abuse or dependence symptoms, and (6) a count measure of UM-CIDI Conduct Disorder symptoms. Optimal cluster solutions were determined using cluster size, conceptual interpretability, and maximized between-cluster differences in component variables via examination of relevant *F*-statistics. Between-cluster profiles were then examined separately for boys and girls to identify meaningful differences

in the multivariate co-patterning of the six component variables. Following the labeling of clusters of boys and girls in optimal maltreatment-externalizing behavior typologies, MANOVAs were used to document relations between cluster membership and serious internalizing problems including: self-reported recent distress, UM-CIDI anxiety disorder symptoms and UM-CIDI affective disorder symptoms. This analysis was implemented to further validate the K-means cluster solutions generated separately for boys and girls.

Results

Table 1 summarizes bivariate correlations, means and standard deviations for key study variables. Correlations for girls are above the diagonal, those for boys are below. There were statistically significant correlations between all CATS childhood maltreatment variables with the exception of the correlation between sexual abuse and punishment for boys. For both boys and girls, alcohol abuse and dependence symptom counts were significantly correlated with most other variables. However, among boys there was not a statistically significant correlation between either sexual abuse scores or punishment scores and alcohol abuse and dependence scores. In addition, conduct disorder symptoms were significantly correlated with only neglect/negative home environment scores of the CATS subscales for both boys and girls. For boys, affective disorder symptom scores were significantly correlated with all three types of childhood maltreatment experiences. In contrast, among girls, affective disorder symptom scores were significantly correlated with only self-reported neglect and negative home environment scores. A .50 correlation between affective disorder symptoms scores and drug abuse and dependence symptoms for girls indicates substantial co-occurrence of drug use and

mood-related problems among girls in this sample. Girls reported higher mean scores for all variables except conduct disorder symptoms.

Between-Cluster Differences in Externalizing Problems

For boys, the 3-part cluster solution (Table 2) yielded clusters of varying size [Cluster 1 ($n = 134$), Cluster 2 ($n = 83$), Cluster 3 ($n = 47$)] with significant between-cluster differences for each component variable, providing initial support for the selection of the six component variables and the cluster solution generated. Members of Cluster 1 reported below average mean scores for childhood maltreatment, substance abuse and dependence symptoms, and conduct disorder symptoms. Cluster 1 was labeled the 'Low Adversities' group. Members of Cluster 2 reported the highest mean scores for alcohol and drug abuse and dependence symptoms and conduct disorder symptoms, but the lowest mean scores for childhood maltreatment. Therefore, Cluster 2 was labeled the 'High Externalizing' group. Members of Cluster 3 reported the highest mean scores for all three childhood maltreatment variables, as well as elevated scores for alcohol and drug abuse and dependence symptoms and conduct disorder symptoms. Therefore, Cluster 3 was labeled as the 'Multiple Adversities' group. For boys, then, extensive experiences of childhood maltreatment, especially punishment, appear to influence substance use behavior during adolescence, as seen in the Multiple Adversities group. However, substance abuse and dependence symptoms and conduct disorder symptoms were not solely influenced by childhood maltreatment experiences, as seen in the High Externalizing group (Cluster 2), who reported comparatively lower experiences of childhood maltreatment.

Table 1 Bivariate correlations among study variables

	1	2	3	4	5	6	7	8	9	M_G	SD_G
1. CATS sexual abuse	–	.42**	.48**	.24**	– .06	.10	.20*	.07	– .03	1.51	.71
2. CATS punishment	.09	–	.56**	.29**	.01	.13	.24*	.14	– .01	2.65	.84
3. CATs neglect/NHE	.26**	.49**	–	.38**	.15	.24*	.34**	.33**	.12	2.66	.84
4. CIDI alcohol abuse or dependence symptoms	.08	.06	.17**	–	.54**	.45**	.38**	.48**	.23*	2.19	2.68
5. CIDI drug abuse or dependence symptoms	– .16*	.03	.19**	.39**	–	.47**	.12	.50**	.24**	4.74	3.83
6. CIDI conduct disorder symptoms	.01	.07	.21**	.28**	.42**	–	.03	.30**	.30**	8.04	3.09
7. GHQ distress score	.15*	.05	.20**	.20**	.11	.08	–	.35**	.17	1.38	.52
8. CIDI affective symptoms	.15*	.18**	.38**	.25**	.28**	.25**	.32**	–	.44**	5.23	4.93
9. CIDI anxiety symptoms	.12	.11	.20**	.15*	.26**	.29**	.26**	.46**	–	9.77	6.83
M_B	1.09	2.47	1.95	1.31	4.41	8.27	1.13	2.12	7.28		
SD_B	.24	.69	.68	1.97	3.37	3.22	.31	3.26	4.53		

Bivariate correlations for girls are shown above the diagonal. Bivariate correlations for boys are shown below the diagonal. G indicates M and SD for the girls in the sample. B indicates M and SD for the boys in the sample. * $p < .05$, ** $p < .01$

Table 2 Mean scores of non-standardized component variables for the three-part cluster solution for boys

Component variable	Low adversities (<i>n</i> = 134)		High externalizing (<i>n</i> = 83)		Multiple adversities (<i>n</i> = 47)		Test statistic <i>F</i> (2, 261)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sexual abuse	1.05 _a	.12	1.06 _a	.13	1.26 _b	.45	16.318*
Punishment	2.20 _a	.53	2.42 _b	.54	3.32 _c	.59	73.439*
Neglect	1.59 _a	.39	2.03 _b	.51	2.82 _c	.71	108.259*
Alcohol abuse	.38 _a	.72	3.07 _b	2.47	1.17 _c	1.52	72.138*
Drug abuse	2.88 _a	2.38	7.89 _b	2.22	3.55 _a	2.88	114.293*
Conduct disorder	7.28 _a	2.20	10.40 _c	2.65	9.19 _b	2.74	43.116*

For the MANOVA of non-standardized component variable scores by cluster membership, Pillai's Trace = 1.22, $F(12, 514) = 66.69$, $p < .001$. Cluster means for component variable scores with different subscripts were significantly different by Tukey HSD tests with significance levels of .001. * $p < .001$

For girls, the three-part cluster solution (Table 3) yielded clusters of smaller size due to the smaller number of girls in this outpatient sample [Cluster 1 ($n = 16$), Cluster 2 ($n = 57$), Cluster 3 ($n = 34$)]. Comparable to findings among the boys, the optimal solution for girls demonstrated significant between-cluster differences for each component variable. Members of Cluster 1 reported the highest scores for childhood maltreatment, as well as elevated alcohol abuse and dependence symptoms and conduct disorder symptoms. Cluster 1 was labeled the 'Multiple Adversities' group. Members of Cluster 2 reported below average mean scores for childhood maltreatment, substance abuse and dependence symptoms, and conduct disorder symptoms. Therefore, Cluster 2 was labeled the 'Low Adversities' group. Members of Cluster 3 reported the highest mean scores for alcohol and drug abuse and dependence symptoms and conduct disorder symptoms. Therefore, Cluster 3 was labeled the 'High Externalizing' group.

Based on these findings, it appears that the small Multiple Adversities group (Cluster 1) of adolescent girls presenting in this outpatient sample experienced substance abuse and dependence symptoms in conjunction with their childhood maltreatment experiences, potentially

implicating distal factors such as childhood sexual abuse in the development of their alcohol abuse and dependence symptoms. In addition, childhood neglect/negative home environment may have influenced the expression of substance abuse and dependence and conduct disorder symptoms, as neglect/negative home environment scores were elevated in both the Multiple Adversities group and the High Externalizing group (Cluster 3). How childhood maltreatment experiences influenced the development of alcohol or drug abuse and dependence symptoms or conduct problems likely differed between girls and boys. While both boys and girls in this sample were classified into optimal 3-part cluster solutions, the defining features of the clusters in each solution varied substantially in terms of their multivariate patterns of mean component variable scores. Girls in this outpatient substance abuse treatment sample reported substantially higher scores for alcohol and drug abuse and dependence symptoms across clusters. Additionally, girls in this outpatient sample reported conduct disorder symptom counts comparable to those of the boys, a finding that clearly differentiates this sample of girls from the general population of adolescent girls.

Table 3 Mean scores of non-standardized component variables for the three-part cluster solution for girls

Component variables	Multiple adversities (<i>n</i> = 16)		Low adversities (<i>n</i> = 57)		High externalizing (<i>n</i> = 34)		Test statistic <i>F</i> (2, 104)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sexual abuse	2.90 _b	.63	1.28 _a	.38	1.24 _a	.32	108.607*
Punishment	3.64 _b	1.04	2.35 _a	.60	2.69 _a	.74	20.049*
Neglect	3.73 _c	.67	2.29 _a	.67	2.77 _b	.70	28.670*
Alcohol abuse	4.19 _b	2.83	.37 _a	.80	4.56 _b	2.29	70.223*
Drug abuse	4.88 _b	3.44	2.95 _a	2.95	8.14 _c	2.86	32.028*
Conduct disorder	9.44 _b	2.97	7.11 _a	1.92	9.79 _b	2.93	14.857*

For the MANOVA of non-standardized component variables by cluster membership, Pillai's Trace = 1.33, $F(12, 200) = 32.92$, $p < .001$. Cluster means for component variables with different subscripts were significantly different by Tukey HSD tests with significance levels of .001. * $p < .001$

Between-Cluster Differences in Internalizing Problems

To further validate the optimal maltreatment-externalizing behavior typologies generated via K-means cluster analysis separately for both boys and girls, multivariate patterns of between-cluster differences were documented for serious internalizing problems, including total distress, UM-CIDI anxiety disorder symptoms and UM-CIDI affective disorder symptoms. These comparisons also allowed us to identify specific gender differences in associations between membership in a maltreatment-externalizing behavior typology and serious internalizing problems. Table 4 summarizes between-cluster differences in mean internalizing variable scores for the boys in this outpatient substance abuse treatment sample. For boys, there were no significant between-cluster differences on mean scores for overall distress. In contrast, significant between-cluster differences were identified for both mean anxiety disorder symptoms ($p < .01$) and mean affective disorder symptoms ($p < .001$). Further comparisons of cluster means for anxiety disorder and affective disorder symptoms revealed that the Low Adversities group (Cluster 1) reported significantly lower mean anxiety disorder symptoms than the Multiple Adversities group (Cluster 3). The Low Adversities group also reported significantly lower mean affective disorder symptoms, compared to the other two groups of boys. Among boys, fewer childhood adversities and lower scores for current substance use and conduct problems

(Cluster 1) were associated with lower mean scores for indicators of serious internalizing problems.

Between-cluster comparisons for mean internalizing problem scores revealed that for girls (Table 5), there were no significant between-cluster differences on mean scores for anxiety disorder symptoms. In contrast, significant between-cluster differences were identified for both mean affective disorder symptoms ($p < .001$) and mean overall distress scores ($p < .001$). Further comparisons of cluster means for affective disorder symptoms and overall distress scores revealed that members of the Low Adversities group (Cluster 2) reported significantly lower mean distress scores than the Multiple Adversities group (Cluster 1). In addition, the Low Adversities group reported significantly lower mean affective disorder symptoms, compared to the other two groups of girls. These significant between-cluster differences provide additional support for the cluster solution for girls in that they identify meaningful and expected between-cluster differences with regard to serious internalizing problems. For both boys and girls, then, clusters defined by low childhood adversities, and thus lower risk for maladaptive life outcomes, reported the lowest mean scores for serious internalizing problems. Although the Multiple Adversities groups differed phenotypically by gender, documented between-cluster differences confirmed that these groups experienced higher risk for adverse outcomes by identifying subgroups of boys and girls who reported high levels of internalizing symptoms. These results also highlighted meaningful group differences between boys and girls.

Table 4 Mean scores for internalizing problems for the three-part cluster solution for boys

Internalizing variable	Low adversities		High externalizing		Multiple adversities		$F(2, 261)$
	$(n = 134)$		$(n = 83)$		$(n = 47)$		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Distress	1.09	.25	1.18	.41	1.18	.27	3.00
Anxiety disorder	6.63 _a	3.17	8.13 _{ab}	5.47	8.70 _b	4.66	5.53*
Affective disorder	1.11 _a	2.10	3.17 _b	3.93	3.45 _b	3.86	16.03**

For the MANOVA of non-standardized internalizing problems variables by cluster membership, Pillai's Trace=0.12, $F(2, 261)=5.32$, $p < .01$. Cluster means for internalizing variables with different subscripts were significantly different by Tukey HSD tests. * $p < .01$; ** $p < .001$

Table 5 Mean scores for internalizing problems for the three-part cluster solution for girls

Internalizing variable	Multiple adversities		Low adversities		High externalizing		$F(2, 104)$
	$(n = 16)$		$(n = 57)$		$(n = 34)$		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Distress	1.68 _b	.58	1.20 _a	.41	1.49 _{ab}	.57	7.35*
Anxiety disorder	10.31	6.31	9.04	6.24	12.06	7.41	2.21
Affective disorder	6.00 _b	4.56	3.23 _a	4.01	8.47 _b	4.45	16.56*

For the MANOVA of non-standardized internalizing problems variables by cluster membership, Pillai's Trace=0.31, $F(2,104)=6.22$, $p < .001$. Cluster means for internalizing problems variables with different subscripts were significantly different by Tukey HSD tests. * $p < .001$

Discussion

This study used K-means cluster analysis to generate unique and non-overlapping groups of boys and girls receiving outpatient substance abuse treatment services, forming maltreatment-externalizing behavior typologies by gender. These typologies exploited heterogeneity in this substance abuse treatment sample to identify clients who are more likely to be at higher risk for poor treatment outcomes (e.g., low engagement, treatment dropout, relapse). There were meaningful similarities and differences in the composition of the optimal 3-cluster solutions selected for both boys and girls, generated from three childhood maltreatment and three adolescent externalizing behavior variables. Associations among cluster membership and serious internalizing problems also showed similarities and differences for boys and girls. The results described significant co-patterning among (a) childhood maltreatment experiences and adolescent externalizing behaviors and (b) associations between typology membership and co-occurring serious internalizing problems. While the results of the present study and specific gender differences identified therein were driven by sample composition, there are practical implications for provision of substance abuse treatment services to adolescents.

Gender differences documented in relations between childhood maltreatment experiences and co-occurring psychiatric symptoms among adolescents may be used to inform substance abuse treatment service providers of the unique needs of subgroups of boys and girls. While Low Adversities and High Adversities groups emerged for both boys and girls, girls in the comparable cluster groups reported generally similar or higher mean scores for maltreatment and externalizing behavior variables. Our findings support clinical observations that girls accessing substance abuse treatment services often present with severe patterns of co-occurring externalizing and internalizing symptoms due in part to gender-specific barriers to accessing substance abuse treatment services (Green, 2006; Green et al., 2002). While both boys and girls in this sample reported symptoms of anxiety, depression and suicidality, girls reported higher scores for serious internalizing problems, presenting challenges for substance abuse treatment implementation and outcomes (O'Neil, Conner, & Kendall, 2011). Therefore, front-line substance use treatment service providers, including social workers, adopt a range of effective engagement strategies to improve substance abuse intervention and treatment outcomes among adolescents presenting with substance abuse problems and co-occurring psychiatric symptoms (e.g., Dunne, Bishop, Avery, & Darcy, 2017).

Our findings suggest that multiple pathways may exist between patterns of child maltreatment-adolescent

externalizing behaviors and the experience of co-occurring internalizing symptoms. Among boys, mean scores for affective and anxiety disorder symptoms did not differ significantly between the Multiple Adversities group (Cluster 3) and the High Externalizing group (Cluster 2). Boys in Cluster 3 reported significantly higher mean scores for all forms of maltreatment, while boys in Cluster 2 reported the highest mean substance abuse and dependence and conduct disorder symptom scores. Among girls, mean affective and anxiety disorder symptom scores and mean distress scores did not significantly differ between the High Externalizing group (Cluster 3) and the Multiple Adversities group (Cluster 1). Girls in Cluster 3 reported significantly higher mean scores for drug abuse and dependence symptoms, while girls in Cluster 1 reported significantly higher mean scores for all three measures of childhood maltreatment experiences. These findings suggest that for both boys and girls accessing substance abuse treatment services, subgroups reporting serious internalizing problems, including suicidality, may also report extensive patterns of childhood maltreatment experiences with or without concurrent heavy substance use and conduct problems (Deas & Brown, 2006; Shin, McDonald, & Conley, 2018).

Overall, these findings suggest that a maltreatment-externalizing behavior typology generated separately by gender reflect both similarities and differences in the life experiences of boys and girls accessing substance abuse treatment services. Subgroups identified in our study provide insights about variations in relations among childhood maltreatment, past-year externalizing problems and past-year internalizing problems for boys and girls and opportunities to tailor substance abuse treatment services to the needs of unique groups of adolescent clients (Ng & Weisz, 2016; Oral et al., 2016; Winters et al., 2018). The typological approach used in our study incorporated gender differences in mean levels of specific component variables (e.g., sexual abuse) and preserved individual differences in patterns of maltreatment and externalizing variables to generate unique groups of boys and girls. These subgroups, characterized by members with substantially different life experiences, are likely to use drugs and alcohol for substantially different motivations (e.g., numbing, dissociation, anxiety reduction versus social enhancement; Barrett & Turner, 2006; Widom et al., 2006). Differences in motivations or coping strategies associated with substance use are likely to reflect clients' perceptions and valuing of substance use reduction, and thus their levels of engagement (Smith, Cleeland, & Dennis, 2010).

Implications for Substance Abuse Intervention and Treatment

Substance abuse treatment outcome studies indicate that clients' serious internalizing problems present challenges for substance abuse treatment engagement and completion (Daughters et al., 2005; DiMatteo, Lepper, & Croghan, 2000). These challenges include treatment dropout, relapse, lack of motivation for positive behavioral change and noncompliance. Adverse childhood experiences and concurrent externalizing behaviors may promote internalizing symptoms or maintain distress and thus influence substance abuse treatment outcomes (Muniz et al., 2019). The present study sought to provide information about the differential patterning of girls' and boys' life experiences to substance abuse intervention and treatment planners for gender-related tailoring of substance abuse intervention and treatment strategies for adolescents presenting with substance abuse and co-occurring psychiatric symptoms. The first step in tailoring substance abuse treatment plans to adolescents' unique needs involves routine screening for childhood maltreatment experiences in outpatient substance abuse treatment facilities at treatment entry, regardless of client gender (Dennis & Stevens, 2003).

This study also provides important information for modifying service delivery procedures in outpatient substance abuse treatment settings for adolescents. Adolescents identified as manifesting complex, extensive experiences of childhood maltreatment and concurrent externalizing behaviors at treatment entry may benefit from additional therapeutic services designed to address specific aspects of maltreatment history, resulting trauma or current mental health issues. Such tailoring or layering on of treatment services may enhance substance abuse treatment engagement and retention and may be appropriate for enhancing relapse prevention strategies. A relevant supplemental treatment option for adolescents with extensive maltreatment histories is Trauma Focused Cognitive Behavioral Therapy (TF-CBT; Deblinger, Mannarino, Cohen, Runyon, & Steer, 2010). This treatment option may be implemented with clients who have experienced trauma related to past abuse and emotional neglect, as well as to address subsequent psychopathology and substance abuse. TF-CBT not only implements a life-course perspective through components of treatment procedures, but it aligns with ecodevelopmental theory and addresses many concurrent risk factors experienced by children with extensive histories of maltreatment (Teruya & Hser, 2010). These developmental adversities include: harsh and inconsistent parenting, neuropsychological deficits, maladaptive decision-making or risk-taking behavior, as well as current internalizing and externalizing symptoms.

The option to address childhood maltreatment or trauma directly in outpatient substance abuse treatment services should be prioritized for adolescent clients, and in particular girls, when screening at substance abuse treatment entry documents extensive histories of childhood maltreatment and current externalizing and internalizing problems. Similarly, as substance abuse treatment services are delivered, monitoring of potential bidirectional influences between concurrent externalizing and internalizing behaviors is critical to facilitate positive substance abuse treatment outcomes among adolescents with extensive maltreatment histories. In our study, for boys and girls in the High Adversities clusters, childhood maltreatment and negative consequences of ongoing externalizing behaviors may maintain or act as a trigger for distress or other internalizing problems. Ongoing distress may be a substantial challenge to substance abuse treatment effectiveness and the reduction of subsequent maladaptive outcomes (Gonzalez, Anglin, Beattie, Ong, & Glik, 2012).

Several limitations in the present study should be acknowledged. First, K-means cluster analysis is a data-driven descriptive statistical technique. While it was useful for defining and profiling specific subgroups of boys and girls in this outpatient substance abuse treatment sample, the use of a different clustering technique in this or another sample of adolescents with substance abuse problems may have generated somewhat different clusters representing different subgroups of clients. Second, this sample of adolescents from two outpatient facilities in South Florida is far more ethnically and racially diverse than the general population of adolescents presenting to outpatient substance abuse treatment facilities. Therefore, our results may not generalize to adolescents who: do not access substance abuse treatment services, access outpatient substance abuse treatment services in a different part of the nation or access more intensive substance abuse treatment services. Third, the variables used in analyses in this study consisted solely of self-report measures. Thus, it is likely that scores on some of these measures may be subject to one or more sources of bias, including underreporting due to stigma, faulty recall or single-source bias. Future research can improve on these limitations and examine further the role of maltreatment experiences and externalizing behaviors in substance abuse treatment processes and outcomes.

Conclusion

The use of typological analytic strategies to describe substance abuse treatment or other clinical samples can provide important insights regarding sample heterogeneity, as well as the unique needs of specific subgroups of clients and appropriate strategies for tailoring substance abuse treatment services to address their needs (see for example,

Walker, Bishop, Nurius, & Logan-Greene, 2016). In the present study, homogenous subgroups of boys and girls were identified, based on childhood maltreatment experiences and past year substance use disorder and conduct disorder symptoms. Cluster membership was associated with distinct patterns of serious internalizing problems. Between-cluster differences on component variables or sets of conceptually independent antecedent variables can provide clues regarding: (a) underlying developmental pathways that preceded membership in a particular group or (b) factors that may moderate treatment impact. The development of descriptive profiles of homogenous subgroups of clients can also help to identify the limitations of generalized approaches to providing substance abuse treatment or other services to adolescent clients, and in particular, when those subgroups are distinct on the basis of gender or other critical characteristics.

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Compliance with Ethical Standards

Conflict of interest We certify on behalf of both authors of this manuscript that the authors of this manuscript have no real, perceived or potential conflicts of interest to report, and that there has been no duplicate submission of the manuscript.

Ethical Approval We certify that the present research study was approved by the Institutional Review Board (IRB) at Florida International University where the original research study was carried out. We have read and we confirm that the contents of the manuscript, including the treatment of human research participants, is consistent with the *APA Ethical Principles of Psychologists and Code of Conduct* (APA Standard 8).

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