Published in final edited form as:

J Child Adolesc Subst Abuse. 2016 ; 25(6): 613–625. doi:10.1080/1067828X.2016.1175983.

Adolescent Male Conduct-Disordered Patients in Substance Use Disorder Treatment: Examining the “Limited Prosocial Emotions” Specifier

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Abstract

To our knowledge, this is the first study to examine the DSM-5-defined conduct disorder (CD) with limited prosocial emotions (LPE) among adolescents in substance use disorder (SUD)

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Financial Disclosures: The other authors report no conflicts of interest.

treatment, despite the high rates of CD in this population. We tested previously published methods of LPE categorization in a sample of male conduct-disordered patients in SUD treatment (n=196). CD with LPE patients did not demonstrate a distinct pattern in terms of demographics or comorbidity regardless of the categorization method utilized. In conclusion, LPE, as operationalized here, does not identify a distinct subgroup of patients based on psychiatric comorbidity, SUD diagnoses, or demographics.

Keywords

conduct disorder; limited prosocial emotions; psychopathy; callousness; uncaring; unemotional

Introduction

For over a decade, our research group has studied youths with substance problems severe enough to merit treatment entry in adolescence (e.g., Sakai, Hall, Mikulich-Gilbertson and Crowley, 2004). These youths represent about 11% of all substance use disorder treatment admissions and in 2010, more than 200,000 adolescents (ages 12-19) were admitted to substance use disorder treatment in the US (Substance Abuse and Mental Health Services Administration, 2012). Although evidence-based treatments exist for this population, they tend to be of moderate effect size (Waldron and Turner, 2008), and various studies suggest such youths may have chronic courses (Crowley, Mikulich, MacDonald, Young and Zerbe, 1998) and high rates of negative life outcomes (Moffitt, et al., 2011).

In general population samples, those with drug dependence are more than eight times as likely as others to have had conduct disorder (CD; Nock, Kazdin, Hiripi and Kessler, 2006) and over half of adolescents with CD meet criteria for a substance use disorder (SUD; Coker et al., 2014). Among adolescents whose externalizing behavior problems are severe enough to merit entry into substance use disorder treatment, very high prevalence of CD is generally seen (Dennis et al., 2004), with more than 80% of such youths having CD in some studies (Sakai, Hall, Mikulich-Gilbertson and Crowley, 2004). While a good deal of work has characterized SUD youths with CD in terms of their longitudinal course and associated comorbid disorders (e.g., Crowley and Riggs, 1995; Walters, 2014; Hopfer et al., 2013), recent findings have suggested that CD is a relatively heterogeneous phenotype and that CD youth might be meaningfully divided based on callous-unemotional traits (e.g., Frick and White, 2008). After reviewing evidence showing that callous-unemotional traits are measurable in childhood (Frick and Ellis, 1999), stable (Frick and White, 2008), and predict worse outcomes (Frick and White, 2008; Frick, Cornell, Barry, Bodin and Dane, 2003; Frick and Dickens, 2006), the Diagnostic and Statistical Manual of Mental Disorders' (DSM-5) ADHD and Disruptive Behavior Disorders Work Group developed and described methods for categorical identification of callous-unemotional traits (Frick and Moffitt, 2012) and included a "limited prosocial emotions" (LPE) specifier for the CD diagnosis in DSM-5 (APA, 2013). Prior work has examined LPE in samples of detained youths with high rates of SUD and this work has failed to link psychiatric comorbidity with CD with LPE vs. CD (Colins and Vermeiren, 2013; Colins and Andershed, 2015) but we have not found studies

that have examined potential differences in this distinct but complementary group, SUD-treatment youths with CD with and without LPE.

To date, the vast majority of work on callous-unemotional traits has been conducted utilizing dimensional measures of this trait (e.g., total scores from measures such as the Inventory of Callous Unemotional Traits; ICU; Frick and White, 2008; Lahey, 2014), but inclusion in the DSM-5 required development and validation of methods for categorization (Frick and Moffitt, 2012). Unfortunately, despite inclusion of a 4-criteria LPE specifier for a CD diagnosis in DSM-5, it is not clearly settled in the research community how best to utilize standard measures, such as the ICU, to generate LPE categorization. For example, the ICU employs a 4-point Likert scale (0=not at all true, 1=somewhat true, 2=very true, and 3=definitely true); some work has used a “split” coding method where scores of 2 or 3 are counted (Frick and Moffitt, 2012; Sakai, Dalwani, Gelhorn, Mikulich-Gilbertson and Crowley, 2012), others have employed an “extreme” coding method where only scores of 3 are counted (Colins and Andershed, 2015), and some have tested both scoring approaches (Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier and Marsee, 2015). The number of questions from the ICU utilized to generate the LPE specifier also has varied, with groups using as few as 4 items or as many as 9 items from the ICU to determine LPE (Frick and Moffitt, 2012; Colins and Andershed, 2015; Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier and Marsee, 2015). While the extreme coding method appears to provide prevalence estimates in community samples more in line with predictions (Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier and Marsee, 2015), the split coding method was found in one study to “most consistently discriminate detained youth with high levels of proactive aggression and violent delinquent behavior” (Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier and Marsee, 2015; Kimonis, Fanti, Goldweber, Marsee, Frick and Cauffman, 2014). As yet, it is unclear whether SUD youths with CD are reliably categorized (LPE yes vs. no) across these various approaches (i.e., do the 4- and 9-item approaches tend to identify the same youths as having LPE?) and whether these approaches to LPE categorization provide information that informs us about callous-unemotional trait severity. This latter point is particularly important, given that much of the work supporting that callous-unemotional traits are predictive of persistent antisocial behavior problems and refractory course have utilized dimensional measures of callous-unemotional traits (Frick and White, 2008; Lahey, 2014); thus, the validity of an LPE categorization method leans heavily on its ability to map onto dimensional measures of severity.

Available evidence from community, school-based, criminal justice or clinically referred samples support that youth with high levels of callous-unemotional traits may differ from other youths in certain demographics (e.g., age and sex; Essau, Sasagawa and Frick, 2006), cognitive measures, such as IQ (Frick, O'Brien, Wootton and McBurnett, 1994; Lynam, 1997; Frick, Cornell, Barry, Bodin and Dane, 2003) and severity of CD (Cale and Lilienfeld, 2002; Frick and White, 2008). Recent models suggest that youth with CD with and without high levels of callous-unemotional traits may have very different biological underpinnings (Blair, 2013) and that youths without high levels of callous-unemotional traits may suffer from heightened threat sensitivity, greater levels of anxiety and reactive aggression (Blair, Leibenluft and Pine, 2014). In contrast, youths with high levels of callous-unemotional traits demonstrate reduced stress responsivity (Blair, Leibenluft and Pine, 2014) and lower levels

of fear and anxiety (Frick, Ray, Thornton and Kahn, 2014). Studies examining detained youths similarly suggest that levels of callous-unemotional or psychopathic traits are positively related to severity of externalizing problems, such as substance abuse, anger/irritability, violence, and hyperactivity (Vahl, Colins, Lodewijks, Markus, Doreleijers, and Vermeiren, 2014; Skeem and Cauffman, 2003). While results regarding internalizing scores are more mixed, some data do support a negative relationship between callous-unemotional or psychopathic traits and internalizing disorders (Colins, Bijttebier, Broekaert and Andershed, 2014) and anxiety (Skeem and Cauffman, 2003). Given this, some groups have begun to investigate whether CD+LPE is associated with distinct patterns of co-morbidity (e.g., ADHD, ODD, major depression or anxiety disorders) in, for example, detained samples (Colins and Vermeiren, 2013; Colins and Andershed, 2015), but we find no such studies focusing on youths with CD in SUD treatment. In addition, given the theoretical models predicting threat sensitivity and reactive aggression in youths with CD without LPE, it may also be important to examine measures associated with extreme irritability. The anger/irritable symptom phenotype of oppositional defiant disorder, which has predicted differential outcomes in past studies (Stringaris and Goodman, 2009; Drabick and Gadow, 2012), might also then be hypothesized to be more common among youth with CD without LPE.

Although the stability of dimensional measures of callous-unemotional traits has been previously studied in children, adolescents and young adults (see Frick and White, 2008 for a review), the stability of callous-unemotional traits, to our knowledge, has not been investigated in SUD populations. This specific focus on SUD populations is important because substance intoxication can increase aggression (Hoaken and Steward, 2003). SUD is defined, in part, by the diminished capacity to control one's use of a drug, despite serious consequences to oneself and others (APA, 2013). Thus, it is reasonable to hypothesize that SUD may be associated with "selfish" decision-making (Tonigan, Rynes, Toscova and Hagler, 2013) and that length of abstinence may be negatively associated with levels of callous-unemotional traits; however, to our knowledge, this has not been tested in the extant literature.

Therefore, the current study focuses on a sample of 196 male adolescent conduct-disordered patients admitted to SUD treatment. We sought to investigate several questions:

1. Using 4 commonly employed approaches to LPE categorization from the ICU (i.e. the 4- vs. 9-question and split vs. extreme coding methods), how prevalent is LPE among youths in SUD treatment with CD?
2. Do these 4 previously employed approaches to LPE categorization from the ICU identify the same SUD treatment youths with CD as having LPE?
3. Do CD patients with and without LPE (using 4 methods of classification) differ in their demographic characteristics?
4. Do these 2 patient groups differ in their performance on tests of cognitive ability?

5. Do these 2 patient groups differ in their rates of substance use disorders or attention deficit and disruptive behavior, anxiety and mood disorders?
6. Does the LPE specifier (using 4 methods of classification) capture information about severity of callous-unemotional traits from the ICU?
7. Does length of abstinence from substance use differ between those with and without LPE (using 4 methods of classification) or predict lower levels of callous-unemotional traits?

Method

Participants

After Colorado Multiple Institutional Review Board's approval, 317 adolescent patients (ages 13-18 years) patients were recruited from two large adolescent substance treatment programs from one metropolitan area (a university-based treatment program and a community hospital based program). Because of a relatively modest sample of females and known sex differences in CD with LPE (Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier, Marsee, 2015), we restricted our sample to males only. Because LPE is meant to be applied only to those with CD, we further restricted our sample to patients with whole-life CD (n=196). Subjects were recruited as part of a larger genetics study. Inclusion criteria included: (1) adolescents identified through their participation in our two clinical programs for substance use disorders; (2) age 13-18 years old; (3) estimated full-scale IQ ≥ 80 ; (4) for subjects 17 years of age or younger, valid written consent from parent or guardian, together with assent from the subject, or for subjects 18 years of age, consent from the subject. Exclusion criteria were: (1) psychosis; (2) obvious intoxication at time of interview; (3) current risk of suicide, violence, or fire setting sufficiently great to interfere with evaluation or to endanger evaluators (though no subject was excluded from the study based on this criterion); and (4) insufficient English skills. Subjects were informed that their research data would be held in strict confidence and was protected by a federal certificate of confidentiality.

Measures

Subjects completed a large battery of assessments including: (1) the Wechsler Abbreviated Scale of Intelligence, vocabulary and block design (WASI; Wechsler, 1999) and (2) the Peabody Individual Achievement Test, Reading Recognition (Dunn and Markwardt, 1970; Luther, 1992); (3) the Composite International Diagnostic Interview-Substance Abuse Module (CIDI-SAM; Cottler et al., 1995); (4) the NIMH Diagnostic Interview Schedule for Children, Version IV (DISC-IV) (Shaffer, Fisher, Lucas, Dulcan and Schwab-Stone, 2000); and (5) the self-report Inventory of Callous-Unemotional Traits (ICU) (Frick, 2004).

From the CIDI-SAM, we used the following measures: lifetime DSM-IV abuse or dependence on cannabis, alcohol, cocaine, amphetamines, opioids, and hallucinogens, and lifetime nicotine dependence. From a CIDI-SAM supplemental recency question, we constructed a length of abstinence variable by taking the most recently used non-nicotine substance for each subject and calculating the time between last use and date of the

interview. We also calculated total number of lifetime substance use disorder diagnoses met. From the DISC-IV, we used the following lifetime measures: meeting DSM-IV criteria for oppositional defiant disorder, attention-deficit/hyperactivity disorder (hyperactive-impulsive type and inattentive type), conduct disorder diagnosis and symptom count, generalized anxiety disorder, and major depressive disorder. From the DISC-IV, we calculated the anger/irritable symptom phenotype of oppositional defiant disorder. Following previous procedures (Drabick and Gadow, 2012), subjects were counted as meeting this phenotype if they had at least 4 oppositional defiant disorder symptoms and endorsed these 3 criteria: often loses temper, is often touchy or easily annoyed by others, and is often angry and resentful. An anger/irritability component of oppositional defiant disorder has predicted differential outcomes in past studies (Stringaris and Goodman, 2009; Drabick and Gadow, 2012).

To compute the callous-unemotional trait scores, we used the ICU in the following ways. We reverse-scored positively worded items (1, 3, 5, 8, 13, 14, 15, 16, 17, 19, 23, 24) so that each item was scored 0-3 with higher scores indicating greater callous-unemotional traits. First, to create a dimensional measure of callous-unemotional traits, we summed all 24 items (range 0-72) to create what we term hereafter the “Total ICU score”. Second, we similarly calculated Callous, Uncaring, and Unemotional subscales of the ICU, grouping items as described by others (see Table 1 in Essau et al., 2006). Finally, we created 4 measures of LPE endorsement based on methods which have been published in the literature utilizing either split coding (counting responses of very true or definitely true as endorsed) or extreme coding (counting only responses of definitely true as endorsed) and utilizing either 4 questions (items 3, 5, 6, and 8) or 9 questions from the ICU to determine whether each of the 4 DSM-5 LPE criteria were met. For the 9 question approach, multiple items informed the LPE criterion: lack of remorse or guilt utilized items 5, 13, 16; callous lack of empathy utilized items 8, 17, 24; unconcerned about performance utilized items 3, 15; and, shallow or deficient affect utilized item 1 (instead of item 6 utilized by the 4-question version). Note that for the 9-question version, where more than one question was utilized for a criterion, the criterion was endorsed if at least 1 item met the specified threshold. At least 2 out of the 4 criteria must be met for the DSM-5 LPE specifier (categorical, yes vs. no; APA, 2013).

Data Analyses

We first divided conduct-disordered patients into those meeting and not meeting the LPE specifier using these 4 methods: 4-question split coding; 4-question extreme coding; 9-question split coding; and 9-question extreme coding. To address our first two questions, we estimated the prevalence of the LPE specifier among the 196 male conduct-disordered patients in SUD treatment. We calculated Cohen's kappas between the four methods along with the 95% confidence intervals, Prevalence Index and Bias Index for each comparison to provide additional information regarding each kappa statistic (Sim and Wright, 2005; Colins, Vermeiren, Schuyten, Broekaert and Soye, 2008). To address questions 3-5, we tested whether CD patients with and without LPE (as determined by each of the 4 methods) differed in demographics (age, race, ethnicity), estimated IQ, prevalence of substance use disorder diagnoses, attention-deficit and disruptive behavior disorders, and anxiety and mood disorders. All continuous variables were assessed for normality and independent *t*-tests or Mann-Whitney U tests were appropriately utilized for group comparisons.

Categorical variables were compared using Pearson chi-square tests or Fisher's Exact tests if greater than 20% of the cells had expected counts less than 5. To address question 6, we tested whether those with and without LPE differed in dimensional measures of callous-unemotional traits (Total ICU score, and callous, uncaring and unemotional subscales). We also tested whether severity of callous-unemotional traits (Total ICU) was negatively correlated with length of abstinence (Question 7) and whether those with LPE vs. those without differed in length of abstinence (separately for each of the 4 categorization methods).

Results

Question 1: Using 4 commonly employed approaches to LPE categorization from the ICU (i.e. the 4- vs. 9-question and split vs. extreme coding methods), how prevalent is LPE among youths in SUD treatment with CD?—Using the 4-question split method, the 4-question extreme method, the 9-question split method and the 9-question extreme method, 50.5%, 6.1%, 83.7%, and 21.9% met the LPE categorization, respectively.

Question 2: Do these 4 previously employed approaches to LPE categorization from the ICU identify the same SUD treatment youths with CD as having LPE?—Kappas between the 4 methods of LPE categorization were calculated but revealed only slight to fair agreement (See Table 1). Ninety five percent confidence intervals, Prevalence Index and Bias Index were reported for each kappa. The high Prevalence Index for the comparison between the 4-question extreme coding method and the 9-question extreme coding method, suggest that our kappa may underestimate agreement; there are also comparisons with elevated Bias Indexes, suggesting kappas may be overestimated in those instances (Sim and Wright, 2005).

Question 3: Do CD patients with and without LPE (using 4 methods of classification) differ in their demographic characteristics?—Table 2 (top 3 data rows) shows results for demographics; no comparisons between those with and without LPE were significant, regardless of the method used to determine LPE. Using the 4-question split method both groups were about 16 years of age, about 60% Caucasian and about 30% Hispanic. Using the 4-question extreme method, both group means were again about 16 years in age. About one third of those without LPE and two thirds with LPE were Caucasian but this difference was not statistically significant. Approximately 29% and 42% of those without and with LPE, respectively, were Hispanic. For the 9-question split method those without and with LPE did not differ significantly in age (16.6 vs. 16.2 years), race (72% vs. 60% Caucasian), or ethnicity (22% vs. 31% Hispanic). Finally, using the 9-questions extreme method, those without and with LPE did not differ in age (about 16 years), race (65% vs. 54% Caucasian) or Hispanic ethnicity (about 30%).

Question 4: Do these 2 patient groups differ in their performance on tests of cognitive ability?—Table 2 (lower rows) presents comparisons between those without and with LPE for estimated IQ, the WASI block t-score, WASI vocabulary t-score and the

PIAT raw score. Using the 4-question split method, CD-with-LPE compared to CD-without-LPE patients had lower estimated IQ and vocabulary t-scores and averaged lower PIAT raw scores. With both the 4-question extreme method and the 9-question split method, there were no significance group differences. Using the 9-question extreme method, patients without LPE had higher WASI vocabulary t-score than patients with LPE.

Question 5: Do these 2 patient groups differ in their rates of substance use disorders or attention deficit and disruptive behavior, anxiety and mood disorders?—As shown in Table 3, no between-group differences were demonstrated for any drug category or for the total number of SUD diagnoses for any of the 4 methods of LPE categorization. In terms of other comorbid disorders (Table 4), groups did not differ in prevalence of oppositional defiant disorder, the anger/irritability symptom phenotype of oppositional defiant disorder, attention-deficit/hyperactivity disorder (hyperactive/impulsive or inattentive subtypes), generalized anxiety disorder, or major depressive disorder. Those with LPE did have significantly higher conduct disorder symptoms counts (except for LPE measured by the 9-question split method).

Question 6: Does the LPE specifier (using 4 methods of classification) capture information about severity of callous-unemotional traits from the ICU?—Next, we assessed how well each of the 4 methods for LPE categorization discriminated groups based on dimensional measures of callous-unemotional trait severity (see Table 5). With only two exceptions (9-question split and extreme methods for the callous subscale of the ICU), on average, those with LPE scored significantly higher on measures of callousness compared to those without LPE, regardless of method of LPE categorization.

Question 7: Does length of abstinence from substance use differ between those with and without LPE (using 4 methods of classification) or predict lower levels of callous-unemotional traits?—Length of abstinence from substances of abuse did not significantly differ between conduct-disordered patients with and without LPE using the 4-question split method ($p=0.19$), the 4-question extreme method ($p=0.54$), the 9-question split method ($p=0.41$) or the 9-question extreme method ($p=0.25$). We tested whether length of abstinence was associated with severity of callous-unemotional trait scores (ICU Total score) in these male patients with conduct disorder. Pearson correlation with length of abstinence (number of days since using any non-tobacco drug) was $r=-0.21$ for Total ICU, which was significant at the $p<0.05$ level.

Discussion

The DSM-5 has included a “with limited prosocial emotions” specifier for the conduct disorder diagnosis. That decision was bolstered by important work often conducted in non-clinical samples, utilizing various conduct problems definitions and dimensional measures of callous-unemotional traits (Lahey, 2014). Now work is needed in clinical populations of patients meeting a clinical diagnosis of conduct disorder, while utilizing the DSM-5-defined categorical LPE specifier. Given the high rate of conduct disorder seen among adolescents referred for SUD treatment, we sought to estimate the prevalence of CD-with-LPE in this

clinical population and to better understand the demographic and diagnostic characteristics of this patient sub-population.

Several concerning findings emerged from our results. First, the prevalence of LPE was markedly affected by the method of LPE categorization chosen, with as few as 6% of our conduct-disordered SUD patients meeting LPE while using the 4-question extreme coding method, and as many as 84% of patients meeting LPE while using the 9-question split coding method. Previous approaches to subtyping CD have apparently lost favor because they identified nearly all CD youths as having the specifier (Lahey, 2014); the 9-question split method suffers from this problem. Our kappa statistics indicated only slight to fair agreement between the 4 methods. This suggests that who will and will not be identified as having LPE is highly sensitive to the method of categorization employed.

We sought to test whether the LPE specifier identified a subgroup of conduct-disordered patients in SUD treatment with a distinct pattern of demographic or diagnostic differences. With only a few exceptions, CD patients with LPE did not differ from CD patients without LPE in terms of demographics, estimated IQ, or prevalence of individual SUD diagnoses, in the number of lifetime SUD diagnoses, or the prevalence of oppositional defiant disorder (ODD), the anger/irritability symptom phenotype of ODD, attention-deficit/hyperactivity disorder, generalized anxiety, or major depression. This finding is consistent with a growing body of work from detained samples, which have high rates of SUD, showing those with and without LPE do not differ in prevalence of ADHD, ODD, substance use, mood, and anxiety disorder prevalence (Colins and Vermeiren, 2013; Colins and Andershed, 2015; Van Damme, Colins, and Vanderplasschen, *in press*). Thus, we conclude that the LPE specifier (as operationalized 4 different ways here) does not appear to identify a distinct subgroup of CD patients in SUD treatment in terms of demographics and co-morbid disorders.

Three of the four methods of LPE categorization identified a subgroup of conduct-disordered patients who on average had higher levels of CD severity (see Table 4, CD symptom count; except for the 9-question split method). On one hand, this finding suggests that the LPE specifier may identify a more severely antisocial subgroup among SUD adolescents with CD in treatment. On the other hand, Lahey (2014) has questioned whether callous-unemotional traits might simply serve as a marker for greater CD severity. More work is needed to test whether LPE shows predictive and discriminative validity above and beyond measures of CD severity. Although we cannot address that question in this cross-sectional study, LPE was generally related to CD severity in our sample.

Given that much of the research literature to date has focused on dimensional measures of callous-unemotional trait severity and has shown this is predictive of outcome (Frick and White, 2008; Frick, Cornell, Barry, Bodin and Dane, 2003; Frick and Dickens, 2006), it is important to test how well the DSM-5-defined LPE specifier provides information on callous-unemotional trait severity. As noted, Table 5 suggests that those meeting the criteria for the LPE specifier in our patient sample score significantly higher on dimensional measures of callous-unemotional traits on average. However, when dealing with clinical populations, differences of group averages are necessary but not sufficient. For example, misidentifying someone who does not have high levels of callous-unemotional traits as

meeting the LPE specifier is potentially harmful. LPE was chosen to replace the term callous-unemotional because of concerns the latter term is potentially stigmatizing (Frick, Ray, Thornton, and Kahn, 2014), but the two terms may be conflated among clinicians and researchers. Prior research has shown that labels such as psychopathy can be stigmatizing and affect legal decision making (Edens, Clark, Smith, Cox, and Kelley, 2013; Edens, Davis, Fernandez, Smith, Guy, 2013). Thus, there is some urgency for the research community to develop standard methods for LPE categorization and assure that LPE validly identifies an important subtype of those with CD.

Finally, we also tested whether recency of substance use was associated with levels of callous-unemotional traits and the LPE specifier. We hypothesized that substance use disorders, which are characterized by pursuit of a drug despite important consequences often to one's self and one's loved ones, may induce a state where youths make more callous-unemotional choices and have diminished capacity to make decisions strongly influenced by prosocial emotions. Based on this logic, high rates of LPE could be due to substance-induced symptoms. To explore this possibility, we tested whether callous-unemotional trait scores decreased after longer abstinence from substances of abuse. While the correlations were significant and in the proposed direction (e.g., -0.21), length of abstinence only explained $\sim 4\%$ or less of the variance in callous-unemotional trait severity, suggesting recent substance use was not a major influence.

Limitations

Our results must be interpreted while considering the study's limitations. (1) Although our procedures are similar to prior research (Sakai, Dalwani, Gelhorn, Mikulich-Gilbertson and Crowley, 2012; Colins and Andershed, 2015; Kimonis, Fanti, Frick, Moffitt, Essau, Bijttebier and Marsee, 2015), our approach differs in some important ways from the manner in which the LPE specifier may be assessed in practice. For example, clinicians often consider both self and informant (i.e. parent, teacher, peer) sources, with any positive report indicating endorsement; here, we assessed only self-report. However, some recent work with detained youths using both self- and parent-report measures did not find significant differences between those with and without LPE in ADHD, ODD, any substance use disorder, any mood disorder and any anxiety disorder (Van Damme, Colins, and Vanderplasschen, *in press*). These results are highly consistent with our findings. (2) Our study recruited patients admitted to adolescent substance treatment. Thus, our results are not generalizable to community or other clinical samples but may be of use when considering similar adolescent SUD treatment populations. (3) We restricted our sample to males and our results should not be extrapolated to females. Future studies should replicate our methods in adolescent female patients. (4) Our study utilized a cross-sectional design, so we are unable to comment on the LPE specifier's predictive validity. (5) We did not employ a correction for multiple testing. However, our results predominantly show a lack of significant group differences regardless of method of LPE categorization.

Conclusions

Using these 4 previously published methods for LPE specifier categorization, we identify individuals with LPE who, on average, score higher on callous-unemotional trait scores on dimensional measures. But the prevalence of LPE varied widely between methods and kappa statistics showed only slight to fair agreement between LPE categorization methods. Thus, these 4 methods did not generally identify the same individuals as having the LPE specifier. Male adolescent conduct-disordered patients with and without the LPE specifier were not easily distinguished in terms of substance use disorder prevalence, attention-deficit/hyperactivity disorder, oppositional defiant disorder, generalized anxiety disorder, or major depression prevalence; however, CD patients with-LPE had higher conduct disorder symptom counts. More work is needed to validate the within-individual stability of LPE categorization across time and the predictive validity of LPE categorization using longitudinal designs. Such work would aid in the development of consensus approaches to LPE categorization from measures such as the ICU.

Acknowledgments

Sources of Funding: This work was supported by grants DA011015 and DA021913 from the National Institute on Drug Abuse; Dr. Sakai's lab is supported by R01DA031761 and by the Kane Family Foundation and the Hewitt Family Foundation. Dr. Salomonsen-Sautel received support from grant T32AA007464. Dr. Hopfer receives support from R01DA035804 and K24DA032555. Dr. Mikulich-Gilbertson's effort is supported by DA034604. The funders had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

Dr. Sakai received reimbursement in 2012 for completing a policy review for the WellPoint Office of Medical Policy & Technology Assessment (OMPTA), WellPoint, Inc., Thousand Oaks, CA. He also served as a board member of the ARTS Foundation until June 2015.

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Table 1

Agreement (Cohen's Kappas) between 4 methods for LPE categorization in a sample of conduct-disordered male patients in substance use disorder treatment (n=196). We also present the 95% confidence interval, Prevalence Index (PI) and Bias Index (BI) for each comparison.

	4-question split coding method	4-question extreme coding method	9-question split coding method	9-question extreme coding method
4-question split coding method	1	K=0.12 (95% CI= -0.53, 0.77); PI=0.4; BI=0.4	K=0.31 (95% CI= 0.21, 0.41); PI=0.3; BI=0.	K=0.11 (95% CI= -0.01, 0.22); PI=0.3; BI=0.3
4-question extreme coding method		1	K=0.03 (95% CI=0.01, 0.04); PI=0.1; BI=0.8	K=0.30 (95% CI= 0.14, 0.45); PI=0.7; BI=0.2
9-question split coding method			1	K=0.10 (95% CI=0.06, 0.15); PI=0.1; BI=0.6
9-question extreme coding method				1

Examining between-group differences in demographics, IQ and Reading using the 4 methods of LPE categorization in a sample of conduct-disordered male patients in substance use disorder treatment (n=196)

Table 2

	4-question split method				4-question extreme method				9-question split method				9-question extreme method			
	CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)		
Age in years Mean (SD)	16.4 (1.09)	16.2 (1.13)	t ₁₉₄ =1.84; p=0.07	16.3 (1.12)	15.8 (1.03)	t ₁₉₄ =1.49; p=0.14	16.6 (1.19)	16.2 (1.09)	t ₁₉₄ =1.84; p=0.07	16.3 (1.15)	16.3 (1.01)	t ₁₉₄ =0.11; p=0.91	64.7%	53.5%	χ ² =1.80; p=0.18	
Race (Percent Caucasian vs. Other)	64.9%	59.6%	χ ² =0.60; p=0.44	35.9%	66.7%	FE p=0.06	71.9%	60.4%	χ ² =1.51; p=0.22	64.7%			29.4%	30.2%	χ ² =0.01; p=0.92	
Hispanic Ethnicity Percent	28.9%	30.3%	χ ² =0.05; p=0.83	28.8%	41.7%	FE p=0.34	21.9%	31.1%	χ ² =1.09; p=0.30	29.4%			96.5 (10.26)	93.7 (11.89)	t ₁₉₃ =1.54; p=0.12	
IQ Mean (SD)	97.8 (10.76)	93.9 (10.28) (n=98)	t₁₉₃=2.59; p=0.01	96.2 (10.64)	90.2 (10.01)	t ₁₉₃ =1.92; p=0.06	97.0 (10.72)	95.6 (10.68)	t ₁₉₃ =0.68; p=0.50	96.5 (10.26)			48.5 (9.08)	47.8 (10.21)	MW Z=-0.33; p=0.74	
WASI Block t-score Mean (SD)	49.7 (8.47)	47.0 (9.95)	MW Z=-1.79; p=0.07	48.6 (9.27)	45.2 (9.99)	MW Z=-1.12; p=0.26	49.2 (7.63)	48.2 (9.63)	MW Z=-0.11; p=0.92	48.5 (9.08)			46.7 (7.14)	43.9 (9.09)	t₁₉₄=2.13; p=0.03	
WASI Vocab t-score Mean (SD)	47.4 (7.72)	44.8 (7.43)	t₁₉₄=2.44; p=0.02	46.4 (7.61)	42.3 (8.00)	t ₁₉₄ =1.77; p=0.08	47.0 (7.49)	45.9 (7.71)	t ₁₉₄ =0.74; p=0.46	46.7 (7.14)			7.0 (2.38)	7.3 (2.46)	t ₁₉₃ =-0.74; p=0.46	
PIAT Raw Score Mean (SD)	64.2 (8.57)	60.2 (10.14) (n=98)	t_{188.35}=2.96; p=0.003	62.4 (9.61)	58.7 (8.74)	t ₁₉₃ =1.30; p=0.19	62.0 (8.16)	62.2 (9.85)	t ₁₉₃ =0.08; p=0.94	7.0 (2.38)						

FE = Fishers Exact Test; MW = Mann-Whitney U Test

Table 3
Examining between-group differences in lifetime substance use disorder diagnoses using the 4 methods of LPE categorization in a sample of conduct-disordered male patients in substance use disorder treatment (n=196)

	4-question split method				4-question extreme method				9-question split method				9-question extreme method			
	CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)			CD, LPE(-)	CD, LPE(+)		
Cannabis	88.7%	88.9%	$\chi^2_1 = 0.003$; p=0.96		88.6%	91.7%	FE p>0.99		87.5%	89.0%	FE p=0.76		88.9%	88.4%	FE p>0.99	
Tobacco (dependences)	67.0%	65.7%	$\chi^2_1 = 0.04$; p=0.84		66.8%	58.3%	FE p=0.54		75.0%	64.6%	$\chi^2_1 = 1.29$; p=0.26		66.7%	65.1%	$\chi^2_1 = 0.04$; p=0.85	
Alcohol	61.9%	64.6%	$\chi^2_1 = 0.16$; p=0.69		63.0%	66.7%	FE p>0.99		59.4%	64.0%	$\chi^2_1 = 0.25$; p=0.62		62.7%	65.1%	$\chi^2_1 = 0.08$; p=0.78	
Cocaine	24.7%	22.2%	$\chi^2_1 = 0.17$; p=0.68		23.9%	16.7%	FE p=0.74		18.8%	14.4%	$\chi^2_1 = 0.47$; p=0.49		24.2%	20.9%	$\chi^2_1 = 0.20$; p=0.66	
Amphetamine	21.6%	18.2%	$\chi^2_1 = 0.37$; p=0.54		19.6%	25.0%	FE p=0.71		21.9%	19.5%	$\chi^2_1 = 0.09$; p=0.76		20.3%	18.6%	$\chi^2_1 = 0.06$; p=0.81	
Opioid	28.9%	19.2%	$\chi^2_1 = 2.52$; p=0.11		23.9%	25.0%	FE p>0.99		34.4%	22.0%	$\chi^2_1 = 2.27$; p=0.13		26.8%	14.0%	$\chi^2_1 = 3.04$; p=0.08	
Hallucinogen	24.7%	19.2%	$\chi^2_1 = 0.88$; p=0.35		21.7%	25.0%	FE p=0.73		31.3%	20.1%	$\chi^2_1 = 1.94$; p=0.16		20.9%	25.6%	$\chi^2_1 = 0.43$; p=0.51	
# SUD dx	3.7 (2.34)	3.4 (2.05)	$t_{194} = 0.95$; p=0.35		3.6 (2.18)	3.3 (2.50)	$t_{194} = 0.35$; p=0.72		3.8 (2.40)	3.5 (2.16)	$t_{194} = 0.74$; p=0.46		3.6 (2.21)	3.4 (2.16)	$t_{194} = 0.53$; p=0.60	

FE = Fisher's Exact Test

Examining between-group differences in attention and disruptive behavior, mood and anxiety diagnoses using the 4 methods of LPE categorization in a sample of conduct-disordered male patients in substance use disorder treatment (n=196)

Table 4

	4-question split method				4-question extreme method				9-question split method				9-question extreme method			
	CD, LPE(-)	CD, LPE(+)	$\chi^2_1 = 3.15$; p=0.08		CD, LPE(-)	CD, LPE(+)	FE p=0.55		CD, LPE(-)	CD, LPE(+)	$\chi^2_1 = 3.72$; p=0.054		CD, LPE(-)	CD, LPE(+)	$\chi^2_1 = 0.35$; p=0.56	
ODD (lifetime)	34.0%	46.5%			39.7%	50.0%			25.0%	43.3%			39.2%	44.2%		
ODD Anger/Irritable Criterion?	16.5%	20.2%	$\chi^2_1 = 0.45$; p=0.50		17.9%	25.0%	FE p=0.46		15.6%	18.9%	$\chi^2_1 = 0.19$; p=0.66		17.6%	20.9%	$\chi^2_1 = 0.24$; p=0.62	
ADHD Hyperactive/Impulsive (lifetime)	22.7%	18.6%	$\chi^2_1 = 0.50$; p=0.48		20.9%	16.7%	FE p>0.99		25.0%	19.8%	$\chi^2_1 = 0.45$; p=0.50		20.3%	22.0%	$\chi^2_1 = 0.06$; p=0.81	
ADHD Inattentive (lifetime)	27.8%	22.2%	$\chi^2_1 = 0.82$; p=0.36		24.5%	33.3%	FE p=0.50		28.1%	24.4%	$\chi^2_1 = 0.20$; p=0.66		23.5%	30.2%	$\chi^2_1 = 0.80$; p=0.37	
CD Symptom Count (lifetime)	5.8 (2.49)	7.0 (2.39)	t₉₄ = -3.55 ; p<0.001		6.3 (2.47)	8.8 (1.96)	t₉₄ = -3.41 ; p=0.001		5.7 (2.52)	6.6 (2.49)	t ₉₄ = -1.73; p=0.09		6.2 (2.53)	7.1 (2.35)	t₉₄ = -2.01 ; p=0.05	
Generalized Anxiety Disorder (lifetime)	10.3%	14.1%	$\chi^2_1 = 0.67$; p=0.41		12.0%	16.7%	FE p=0.65		21.9%	10.4%	FE p=0.08		13.7%	7.0%	$\chi^2_1 = 1.42$; p=0.23	
Major Depressive Disorder (lifetime)	21.6%	14.1%	$\chi^2_1 = 1.88$; p=0.17		18.5%	8.3%	FE p=0.70		25.0%	16.5%	$\chi^2_1 = 1.33$; p=0.25		19.0%	14.0%	$\chi^2_1 = 0.57$; p=0.44	

FE = Fisher's Exact Test

Table 5

Testing 4 methods for LPE categorization against callous-unemotional trait severity based on ICU total score (testing whether categorization identifies groups that differ significantly in measures of severity) and cut points (calculating sensitivity and specificity against 1, 1.5 and 2 standard deviations above the mean for ICU total score) using a sample of conduct-disordered male patients in substance use disorder treatment (n=196).

	4-question split method			4-question extreme method			9-question split method			9-question extreme method		
	CD, LPE(-)	CD, LPE(+)		CD, LPE(-)	CD, LPE(+)		CD, LPE(-)	CD, LPE(+)		CD, LPE(-)	CD, LPE(+)	
ICU Total Score Mean (SD)	25.4 (7.35)	34.5 (7.15)	t₁₉₄=-8.78; p<0.001	29.2 (8.11)	42.3 (5.12)	t₁₉₄=-5.50; p<0.001	20.1 (6.37)	31.9 (7.52)	t₁₉₄=-8.35; p<0.001	27.9 (7.76)	37.3 (7.12)	t₁₉₄=-7.15; p<0.001
ICU Callous Subscale Mean (SD)	7.7 (3.90)	11.1 (4.83)	MW Z=-4.97; p<0.001	9.2 (4.54)	13.0 (5.64)	MW Z=-2.44; p=0.02	8.1 (4.54)	9.7 (4.69)	MW Z=-1.74; p=0.08	9.1 (4.45)	10.6 (5.35)	MW Z=-1.63; p=0.10
ICU Uncaring Subscale Mean (SD)	10.2 (4.57)	14.0 (3.75)	t_{185.4}=-6.43; p<0.001	11.8 (4.47)	16.8 (3.98)	t₁₉₄=-3.74; p<0.001	6.0 (2.26)	13.3 (3.93)	t_{73.23}=-14.53; p<0.001	10.7 (4.09)	17.0 (2.29)	t_{123.59}=-13.20; p<0.001
ICU Unemotional Subscale Mean (SD)	7.5 (2.89)	9.4 (2.57)	t₁₉₄=-4.89; p<0.001	8.2 (2.75)	12.5 (1.88)	t₁₉₄=-5.29; p<0.001	6.0 (3.19)	9.0 (2.57)	t₁₉₄=-5.75; p<0.001	8.2 (2.75)	9.7 (3.10)	t₁₉₄=-3.11; p=0.002

MW = Mann Whitney U Test