



Creating profiles of juvenile offenders using functions of aggression and callous-unemotional traits: relations to crime type

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A rich line of criminological theories and research has suggested that individual characteristics may be important to predicting criminal activity. However, there is limited research examining how individual characteristics may be related to the type of crime committed (e.g. violent, sex, drug). To provide guidance to these questions, the current set of two studies used latent profile analysis to identify groups of offenders based on individual factors (i.e. proactive and reactive aggression, and callous-unemotional traits), chosen for their interrelatedness and their established associations with crime, and examined whether these groups relate to type, severity or the number of crimes committed across two studies. In both studies, four groups of offenders were identified, but these groups were not associated with offending behaviors or patterns. Findings and implications are discussed.

Key words: aggression; callous unemotional traits; crime; juvenile delinquency; offending behavior; proactive aggression; reactive aggression.

A rich line of theoretical and empirical criminological research has been devoted to identifying classes of offenders (Barnes et al., 2012; Moffit, 1993; Piquero, 2008), with nearly all of these investigations determining classes of offenders by frequency (e.g. adolescent limited, life-course persistent) and type of offense committed (e.g. status offenses versus criminal offenses, violent versus nonviolent, drug offense; Barnes et al., 2012; Brownfield & Sorenson, 1987; Lee et al., 2007; Muthén & Muthén, 2000). While it is essential to group offenders in terms of the frequency of delinquent acts, understanding how individual characteristics of youth (e.g. personality features) may inform the type of offense committed is

relevant to criminological theories and juvenile justice practices. Crime type is often used to decide whether youth are considered for certain disposition outcomes, such as diversion, probation or incarceration; however, it remains unclear whether these levels of justice involvement correspond to various levels of risk. In order to ensure that the juvenile justice system is appropriately responsive to the needs of youth, evaluating how profiles of clinically relevant factors (e.g. proactive and reactive aggression, and callous unemotional traits) are related to specific crime types provides useful information regarding whether the use of crime type is a valid metric by which to

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decide opportunities for specific dispositional outcomes.

Crosscutting across prominent criminological theories (e.g. Agnew, 1992; Douglas et al., 1986; McGee & Farrington, 2019; Moffit, 1993; Watt et al., 2004), individual characteristics are considered a predisposing factor that may interact with context and opportunities to predict both *whether* someone engages in criminal behavior and what *type* of crime someone may engage in. For instance, the individual characteristic of reactionary aggressive tendencies in combination with a provoking social situation may result in violent behavior. Theorists suggest that underlying offender characteristics result in a diversity of crime types amongst offenders, and these differences may portend varying levels of treatment responsiveness, dangerousness or recidivism (DeLisi et al., 2019; Farrington et al., 1988). The developmental taxonomy of antisocial behavior developed by Moffit (1993) can be useful in understanding juvenile offending behavior. Specifically, the developmental taxonomy suggests the presence of two types of offending patterns, one that begins in childhood and persists throughout the lifespan (i.e. life course persistent) and one that begins and ends during adolescence (i.e. adolescent limited; Eme, 2020; Moffit, 1993). Importantly, a systematic review of prospective studies examining factors that may uniquely predict either a life course persistent or adolescent limited offending pattern found few differences in terms of personality (e.g. high hyperactivity, low scores on neuropsychological measures; Jolliffe et al., 2017), concluding that the two groups may differ in magnitude (e.g. low, medium, high) rather than in kind (i.e. specific risk factors); however, this study did not examine differences in crime type (e.g. violent versus status offenses). According to Moffit's (1993) conceptualization of the developmental taxonomy, the differences between life course persistent and adolescent limited offending patterns are extended to crime type, with life course

persistent youth more likely to engage in violent, person-oriented offending and adolescent limited youth more likely to engage in minor delinquent acts or status offenses. Despite the differences in crime type being elucidated within Moffit's original conceptualization of the developmental taxonomy, it appears that very little attention has been given to this issue in the literature. Accordingly, understanding how characteristics of youth may or may not confer risk to engage in certain types of crime can inform criminological theory and intervention with juvenile offenders.

Proactive aggression, reactive aggression and callous-unemotional traits have all been differentially linked to cognitive factors that may explain how they confer risk for involvement in the justice system, indicating that these cognitions may be important treatment targets. Reactively aggressive children have shown tendencies to interpret events and social situations negatively, have difficulty generating non-aggressive responses, and may not adequately consider outcomes of their behaviors (Muñoz & Frick, 2012). Youth who score high on reactive aggression may benefit from interventions that address cognitions to reinterpret events as neutral and impersonal as well as learning how to generate alternative responses to situations (Denson, 2015). Youth who use aggression proactively have beliefs that aggression is likely to help them achieve goals (Merk et al., 2005; Muñoz & Frick, 2012). For these youth, challenging thoughts about the acceptability of aggression or emphasizing the consequences of aggression may be important treatment targets.

Youth high in callous-unemotional (CU) traits have been shown to have similar beliefs to youth who use proactive aggression (e.g. expectations of positive outcomes, acceptability of using aggression; Muñoz & Frick, 2012). However, they also tend to experience less fear and anxiety, are more sensitive to reward than punishment and have deficits in empathy, specifically affective empathy (Muñoz & Frick, 2012). These cognitive

factors may explain why CU traits are associated with more severe aggression. For youth who endorse high CU traits, interventions may need to include a component that rewards positive behaviors and is consistent with the youth's self-interests (Frick, 2009). In order to provide the most effective treatments for youth, it is important to understand the beliefs that may be maintaining their delinquent behaviors; these may be important treatment targets.

Notably, while CU traits have been linked to more severe antisocial behaviors and poorer treatment outcomes, high levels of these traits are not prevalent in samples of detained youth (Kimonis et al., 2014). Kimonis et al. (2014) found that in a sample of 643 incarcerated adolescents only 14.2% of them met the specifier for 'limited prosocial emotions', which is a specifier that indicates significant levels of CU traits (Kimonis et al., 2014). Other studies with samples of youth with conduct disorder have found the prevalence rate of the specifier to be between 10 and 50% (Kahn et al., 2013). Therefore, while the assessment of CU traits can be helpful in distinguishing high-risk youth, for the majority of detained youth the measurement of these traits may not be informative. Additionally, a study by Matlasz et al. (2020) found that even after controlling for CU traits and previous delinquent acts, reactive and physical aggression (both reactive and proactive physical aggression) were significant predictors of future delinquency. This indicates that risk factors other than CU traits, such as aggression, are important in predicting delinquent behaviors. Therefore, it is essential to explore individual characteristics that may be useful for categorizing these youth in addition to the inclusion of CU traits.

Thus, understanding how profiles of individual characteristics relate to crime type may be important, given that legal professionals (e.g. judges, lawyers) make treatment recommendations and/or establish defense strategies based on the type of crime committed. Accordingly, the current set of two studies

used latent profile analysis (LPA) to identify groups of juvenile offenders based on individual factors (i.e. proactive and reactive aggression, CU traits), chosen for their relevance to theory and engagement in offending behavior (e.g. Pardini & Fite, 2010; Swogger et al., 2015) and examined whether these profiles related to the type of crime committed, the severity of the crime, the number of charges and status of being a child in need of care (CINC).

Proactive and reactive aggression

Proactive and reactive aggression are two empirically and theoretically distinct subtypes of aggression (Raine et al., 2006). Proactive aggression, also known as instrumental aggression, refers to deliberate, aggressive acts aimed at obtaining their desired goal (Card & Little, 2006; Dodge, 1991). In contrast, reactive aggression refers to aggressive acts in response to an actual or perceived threat (Brendgen et al., 2001). Proactive aggression is believed to develop through social learning, wherein aggressive behavior is learned and maintained through rewards (Crick & Dodge, 1996). Notably, proactive aggression has been associated with higher anticipation of rewards resulting from aggressive acts (Crick & Dodge, 1996; Dodge, 1991), whereas reactive aggression is best explained by the frustration-aggression hypothesis, in which aggressive acts are a defensive response to provocation (Dodge, 1991; Dodge & Coie, 1987). Researchers have posited that reactive and proactive aggression are distinguished by the role of anger, motivation and premeditation (Bushman & Anderson, 2001; Fontaine, 2007), suggesting that both subtypes of aggression may be meaningfully and differentially related to different types of offenses. Given that proactive and reactive aggression are associated with differing motivational systems (Pederson et al., 2018), not only may proactive and reactive aggression represent long-term antisocial tendencies, but it is also possible that they differentiate type of crime committed

through short-term activating or motivational factors.

Both forms of aggression have been linked to higher rates of overall delinquency (Marsee et al., 2011; Miller & Lynam, 2006; Vitaro et al., 1998). However, many studies have found different delinquency-related outcomes based on the dominant type of aggression and individual displays (Card & Little, 2006; Cima et al., 2013; Miller & Lynam, 2006; Raine et al., 2006; Vitaro et al., 2002; Vitaro & Brendgen, 2012), with research suggesting more robust associations between proactive aggression and violent crime types. For instance, proactive aggression has been consistently linked with both higher rates of delinquency (Card & Little, 2006; Greco et al., 2009) and more violent forms of offending (Cima et al., 2013; Colins, 2016; Fite et al., 2009; Swogger et al., 2015). Proactive aggression has also been more strongly linked to substance use in children and adolescents (Connor et al., 2004; Fite et al., 2012). Reactive aggression has been associated with anger, hostile attributions, impulsivity and difficulty regulating emotions (Frick & Marsee, 2018; Urban et al., 2018), factors that may confer risk for engaging in antisocial behaviors. Less is known about reactive aggression and its correlation with various crime types, which may be in part because proactive aggression is often the more robust predictor of crime/delinquency, and when controlling for proactive aggression, reactive aggression shows attenuated effects (Ang et al., 2018). Further, reactive aggression has been more consistently, longitudinally linked to internalizing symptoms (i.e. depression, anxiety) and not externalizing symptoms (i.e. conduct problems; e.g. Card & Little, 2006), which may give way to fewer delinquency-like behaviors (Colins, 2016).

Callous-unemotional traits

Callous-unemotional (CU) traits are characterized by persistent behavior that reflects a lack of empathy for others, a lack of guilt for one's

actions, and using others for personal gain (Frick et al., 2014). CU traits are often conceptualized as the developmental precursor to adult psychopathy and are associated with increased risk for aggression, antisocial behavior, violent crime and violent recidivism in youth (Frick & Dickens, 2006; Frick & White, 2008; Leistico et al., 2008; Marsee et al., 2005; Robertson et al., 2018). Youth high in CU traits often exhibit a high number of associated long-term risk factors for antisocial behavior, including poor parenting practices (Waller et al., 2013) and low anxiety (Frick et al., 1999). For example, using a large cohort of youth, Pardini and Fite (2010) found that after controlling for disruptive behavioral disorders (i.e. oppositional defiant disorder, ODD; conduct disorder, CD), CU traits uniquely predicted persistent involvement in the juvenile justice system and being charged with a more serious crime. Similarly, Kahn et al. (2013) found, among young adult men, that CU traits significantly predicted a greater number of charges, more arrests and receipt of an obstruction of justice charge even after controlling for well-established risk factors (e.g. prior offending, substance use). Further, CU traits have also been observed in youth who commit sexual offenses (Caputo et al., 1999; Lawing et al., 2010).

Current study

While proactive aggression, reactive aggression and CU traits have been associated with different types of offending, it is unknown how these characteristics can be used to identify different profiles of offenders, despite their theoretically meaningful distinctions in the literature (Fontaine, 2007). Further, research has demonstrated interrelations between these characteristics, such that CU traits are more strongly associated with proactive aggression (e.g. Marsee & Frick, 2007), and proactive and reactive aggression tend to co-occur at high rates (e.g. Card & Little, 2006). Thus, it appears that these characteristics could meaningfully co-occur within individuals; however,

research to date has examined these characteristics independently of one another, making it difficult to understand how these characteristics may present together within samples of offending youth.

Accordingly, Study 1 aimed to take a preliminary step in identifying classes of juvenile offenders based on theoretically meaningful and empirically supported individual risk factors using LPA. The first aim was to add to the literature by using LPA to identify groups of offenders based on salient individual factors (i.e. proactive and reactive aggression, CU traits). LPA is exploratory in nature (Ferguson et al., 2020), with prior studies intended to guide expectations for group membership (e.g. clustering of individual characteristics). Therefore, no hypotheses were specified regarding the number and precise nature of profiles that would emerge from the data, although at least two profiles representing youth with the highest and lowest scores across all measures were expected to emerge. The second aim was to examine whether these groups were meaningfully related to the number, type, severity of the crime committed and/or status as a CINC. Youth identified as CINC were included in the current study in order to understand whether having a charge was related to group membership. It was expected that profiles displaying higher levels of aggression and CU traits would be related to more violent offending. Further, given that CINC status youth are not charged with a crime, it was expected that profiles with lower levels of aggression and CU traits would be related to CINC status. Additional hypotheses regarding the prediction of other crime types, severity of the crime and number of charges were not specified due to the preliminary nature of the study. Given the novelty of the current study and the data-driven nature of LPAs (Ferguson et al., 2020), Study 2 was conducted to determine whether the findings in Study 1 could be replicated in a larger sample of detained youth across two detention facilities. Consistent with calls within social sciences to address the

replication crisis and report robust findings (De Boeck & Jeon, 2018; Wiggins & Christopherson, 2019), replicated findings across studies would suggest the identification of robust classifications of offending youth.

Study 1

Method

Participants

Participants included 127 youth (73.2% male), 11 to 18 years in age ($M = 15.94$, $SD = 1.67$), admitted consecutively into a Midwestern juvenile detention center within a 12-month period. Youth were admitted into the facility over the course of a year if they were pending court sanctions, serving sanctions imposed by the court or a CINC ($n = 14$). The sample was primarily White (50.4%), with other races and ethnicities represented, including 26.8% Black, 18.1% Hispanic, 3.9% American Indian/Alaskan Native and 0.8% Asian. The average length of stay was 55.17 days ($SD = 80.60$). Correlations amongst the Study 1 variables can be found in Table 1.

Measures

Demographic information. The facility provided researchers with information regarding age, race and sex.

Proactive and reactive aggression. Proactive and reactive aggression were measured using the self-report Peer Conflict Scale (Marsee & Frick, 2007; Marsee et al., 2011). Twenty items were used to measure overt aggression, 10 items measured proactive overt aggression (e.g. 'I carefully plan out how to hurt others'), and 10 items measured reactive overt aggression (e.g. 'When I am teased, I will hurt someone or break something'). Youth rated agreement with these items on a 4-point Likert scale (0 = *Not at all true*, 3 = *Definitely true*). Mean scores were calculated across the two subscales, with higher numbers indicating higher levels of proactive or reactive

Table 1. Study 1: correlation table.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Race													
2. Sex	.00												
3. Age	.11	.02											
4. Days in detention	.01	-.10	.11										
5. Reactive aggression	.19*	-.03	-.16	.01									
6. Proactive aggression	.11	-.03	-.19*	.06	.71***								
7. CU traits	.22*	-.13	.00	.08	.33***	.31***							
8. Sex charge	-.18*	-.03	-.08	.08	-.15	-.16	-.22*						
9. Violent charge	.17	-.10	-.17*	-.06	.15	.13	.02	-.26**					
10. Drug charge	-.17	-.10	.27**	.01	-.21*	-.09	.14	-.11	-.33***				
11. Theft charge	.07	-.20*	.12	.11	.01	-.01	.06	-.22*	.02	-.09			
12. Weapons charge	.00	-.09	-.09	.03	-.11	-.15	-.19*	.21*	.33***	-.22*	.14		
13. CINC	-.10	.30***	-.06	.01	-.03	-.03	-.14	-.12	-.27**	-.18*	-.23**	-.18*	
14. Number of charges	-.01	-.27**	.03	.08	-.12	-.11	-.06	.14	.49***	.11	.50***	.72***	-.50***
M			15.94	55.17	0.76	0.14	1.16						
SD			1.67	80.60	0.48	0.19	0.39						

Note: CU = callous-unemotional; CINC = child in need of care. Race is coded 1 = racial minority, 0 = White. Sex is coded 0 = male, 1 = female. CINC is coded 0 = not a CINC, 1 = CINC. Charges are coded 0 = no, 1 = yes. For number of charges, $M = 1.20$, $SD = 0.85$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

aggression. Proactive aggression demonstrated modest internal consistency ($\alpha = .65$; McDonald's $\omega = .70$), and reactive aggression demonstrated good internal consistency ($\alpha = .84$; McDonald's $\omega = .85$).

Callous-unemotional traits. The Inventory of Callous-Unemotional Traits (ICU; Kimonis et al., 2008) was used to assess for CU traits. Youth rated agreement on 24 items (e.g. 'I do not feel remorseful when I do something wrong'), using a 4-point rating scale (0 = *Not at all true*, 3 = *Definitely true*). Mean scores were used for analyses, such that higher levels were indicative of higher levels of CU traits. The measure demonstrated good internal consistency ($\alpha = .84$; McDonald's $\omega = .86$).

Charge information. The facility provided researchers with information on youth charges at the time of admittance to the facility. Two members of the research team coded each youth's charge(s) independently, with the project coordinator checking for discrepancies. Members of the research team met regularly to discuss any discrepancies and determine a consensus for the severity and type of charge present. Charges were coded to include the severity of the charge (i.e. felony, misdemeanor) and the type of charge (i.e. drug-related charges, violent charges, sex-related charges, theft and weapons charges). Youth could also be considered a CINC (i.e. youth needing placement due to inadequate care from other placements or caregivers), meaning youth were not placed in the facility due to any charge. Individuals who were charged with crimes fitting into more than one category (e.g. aggravated robbery) or charged with more than one crime (e.g. possession of stolen property *and* battery) received multiple codes related to the type of crime, with one exception: sex-related charges were not also coded as violent. Charge severity was coded based on the most severe charge, such that, for youth who were detained based on multiple charges,

if any one of the charges was a felony, the severity of charge was coded as a felony.

Accordingly, five dichotomous (1 = *Yes*, 0 = *No*) codes were developed to reflect the presence of sexually based offenses, violent offenses, drug-related offenses, theft-related offenses and weapons-related offenses. The severity of charge was also coded based on the most severe charge (0 = *Misdemeanor*, 1 = *Felony*, 2 = *No Charge*). Further, a count variable was created indicating the number of different types of charges, with higher numbers indicating youth being admitted to the facility for more types of charges (see Table 2).

Procedure

Youth admitted into the detention center were surveyed as a part of an internal audit being conducted by the facility to better understand individual characteristics that impacted the use of restrictive housing. An independent group, which was composed of members of the research team, completed the audit, including all data collection activities. A de-identified database was provided to the research team from the facility for research purposes, which was approved by the researchers' institutional review board for use.

Survey data were collected for a year (January 2015–January 2016). The assessment battery was typically administered within 24 hours of the youth entering the facility and lasted approximately 15 minutes. Assessment batteries were completed with trained interviewers with at least a bachelor's degree who were not associated with the facility. Interviewer training consisted of watching a trained interviewer administer two surveys and administering two surveys while being supervised by a senior interviewer to ensure fidelity of all research procedures. In addition, interviewers completed a 3-hour volunteer training with the facility and passed background checks. Items were read aloud to youth by interviewers, and youth followed along with a paper copy of the questions. The youth

Table 2. Study 1 and Study 2: charge information.

	Study 1		Study 2	
	<i>n</i>	%	<i>n</i>	%
Number of charge types				
Zero	25	19.7	50	18.6
One	62	48.8	132	49.1
Two	30	23.6	50	18.6
Three	10	7.9	21	7.8
Four	—	—	2	0.7
Type of charge				
Sexually based offense	13	10.2	26	9.7
Violent offense	48	37.8	82	30.5
Drug-related offense	27	21.3	14	5.2
Theft-related offense	38	29.9	55	20.4
Weapons-related offense	26	20.5	65	24.2
Disorderly conduct	—	—	61	22.7
Severity of charge				
Misdemeanor	52	41.0	77	28.6
Felony	60	47.2	127	47.2
No charge	15	11.8	49	18.2

Note: Zero charges may be indicated when a youth was determined to be a child in need of care or committed a parole violation. For type of charge, charges are not mutually exclusive. For Study 2, 14 participants (5.2%) were missing data on charges, and 16 (6.0%) were missing data on severity of charge. Disorderly conduct charges were only coded in Study 2.

responded to items verbally, and the interviewer entered their answers into Qualtrics survey software to account for any literacy or comprehension concerns. If trained interviewers had any concerns regarding data validity, those cases were marked and removed from the dataset.

Data analysis plan

An LPA was conducted using Mplus software (Version 8.4; Muthén & Muthén, 1998–2017) to examine whether there were meaningful underlying groups of youths based on individual characteristics. LPA, a type of mixture model used with continuous variables, was utilized to examine the distribution of potentially meaningful latent profiles within the data (Ferguson et al., 2020). Results provided the probabilities of an individual belonging to each profile. Membership within profiles was determined based on similar patterns of responding on variables of interest, and these profiles were then examined in relation to

other outcomes of interest. To conduct the LPA analysis, an iterative modeling process was performed in which a series of models was tested, each having a different number of profiles (beginning with one), and fit indices were examined to identify a model that best fit the data (Ferguson et al., 2020).

Several different fit statistics were used to identify the final model, including Bayesian information criterion (BIC), sample adjusted BIC (SABIC), Akaike's information criterion (AIC), entropy, Lo, Mendell, and Rubin (LMR) test and the bootstrap likelihood ratio test (BLRT; Ferguson et al., 2020). When comparing models, lower values for BIC, SABIC and AIC indicated better model fit, but the size of the difference of 'lower' values was considered. High entropy values indicated more certainty in classification, thus higher values were desired. Both the LMR and BLRT tests compared the current model to a model with one less profile. For both tests, a *p* value greater than .05 indicated that the current

model did not improve fit compared to the previous model. Decisions about the model fit were based on all available fit statistics, with emphasis placed on the BIC, SABIC and BLRT as these indices have outperformed other indices in previous research and simulation studies. Importantly, in addition to model fit indices, substantive theory was considered to determine whether resulting profile represented meaningful, interpretable groups (Ferguson et al., 2020).

Following model selection, individuals in the present study were assigned to the profile to which they had the highest probability of belonging based on the LPA results. Fisher's exact tests were used to examine whether the type of charge, the severity of the charge (e.g. felony, misdemeanor) or status as a CINC differed among the LPA profiles. Fisher's exact tests were used due to the data not meeting the assumption that all cells of a chi-square test have an expected frequency greater than five (Fisher et al., 2011). A Poisson regression was conducted to examine whether there was a significant difference in the count of different charges across LPA profiles. These tests allowed for an examination of whether these profiles had external validity in identifying individuals at risk for committing certain types of crimes, the severity of crime or mean number of charges. Notably, no missing data were observed due to the nature of data collection. A Kruskal–Wallis test was used to examine whether the age of participants differed among youth belonging to different profiles due to non-normality of the age variable.

Results

An iterative LPA model selection process was completed. First, a model with one profile was run, followed by models increasing by one profile until a model was identified that demonstrated good fit (see Table 3 for fit statistics). The model with four profiles resulted in

the highest entropy with the lowest relative AIC and BIC and a comparable SABIC to that of the five-profile model. The LMR test was inconsistent across models; however, the results of the BLRT test indicated that the five-profile model did not improve fit over the four-profile model. Based on previous research on LPAs and simulation studies, the BIC, SABIC and BLRT were determining factors, and most of the fit indices indicated the four-profile model. Also considered in model selection were theory and meaningfulness of groups. While Profile 2 included few people, they also represented the most extreme scores, which was potentially meaningful. Thus, the four-profile model was retained as the final model (Ferguson et al., 2020).

Means and standard deviations of indicator variables varied across profiles. Profile 1 ('Low'; $n = 83$; 65.35% of the sample) had the lowest mean scores on all indicator variables. Profile 2 ('Extreme'; $n = 2$; 1.58%) had the highest mean score on all three variables, with a notably high score in proactive aggression and CU traits. Profiles 3 ('High Aggression'; $n = 15$; 11.81%) and 4 ('Moderate'; $n = 27$; 21.26%) shared similar CU mean scores, but differed greatly on proactive and reactive aggression, with Profile 3 scoring higher on both types of aggression. The mean of the indicator variables across profiles can be found in Table 4, and the z -scores of the indicator variables are graphed in Figure 1.

Profiles' relation to charges

Individuals were assigned to profiles based on the probability values provided by the LPA analysis. Multiple Fisher's exact tests were conducted to examine whether the profiles were associated with the type of charge an individual received. The profiles to which youths were assigned, based on the LPA, were not meaningfully related to the type of charge(s) youths received, the severity of charges (i.e. felony or misdemeanor), status as a CINC, the mean number of different charges

Table 3. Study 1: fit statistics of each of the LPA models.

Number of profiles	Log likelihood	AIC	BIC	SABIC	Entropy	Smallest class (%)	LMR <i>p</i>	LMR meaning	BLRT <i>p</i>	BLRT meaning
1	-118.53	249.05	266.12	247.14	—	—	—	—	—	—
2	-55.92	131.83	160.28	128.65	.94	17	.06	2 < 1	.00	2 > 1
3	-31.48	90.97	130.78	86.51	.95	2	.01	3 > 2	.00	3 > 2
4	-9.82	55.63	106.83	49.90	.96	2	.07	4 < 3	.00	4 > 3
5	-6.18	56.36	118.93	49.36	.86	2	.89	5 < 4	.47	5 < 4

Note: LPA = latent profile analysis; AIC = Akaike's information criterion; BIC = Bayesian information criterion; SABIC = sample adjusted BIC; LMR = Lo, Mendell, and Rubin test; BLRT = bootstrap likelihood ratio test. Favorable fit statistics are in bold. The LMR test indicated the three-profile model or the one-profile model so no result is in bold for this test. The five-profile model log likelihood and SABIC show only a very marginal improvement over the four-profile model. The five-profile model demonstrated worse entropy and poor BLRT test result compared to that of the four-profile model. Therefore, the four-profile model was chosen as the best fit to the data.

they received or any demographic variables (see Table 5).

Study 2

Method

Participants

Study 2 included 269 youth (71.4% male) aged 11 to 17 years ($M = 15.59$, $SD = 1.38$) detained in two juvenile detention facilities in the Midwest facilities, Facility 1 ($n = 131$; 48.7%) and Facility 2 ($n = 138$; 51.3%). Similar to Study 1, youth who were admitted into these facilities were pending court sanctions, serving sanctions imposed by the court or a CINC ($n = 54$). Youth spent an average of 63.86 days in detention ($SD = 77.63$). Youth identified as Caucasian (46.8%), Black (32.0%), Hispanic (14.1%), American Indian/Alaskan Native (1.9%) and Asian (0.7%). Twelve participants were missing demographic information (4.5%). Correlations amongst the study variables can be found in Table 6.

Chi-square tests indicated that the facilities differed on the severity of charges and the frequency of drug, weapons and disorderly conduct charges ($ps < .05$). Facility 1 had a higher proportion of drug and disorderly conduct charges, and Facility 2 had a higher proportion of felony charges and weapons charges. Facilities did not differ on demographic or the LPA indicator variables ($ps > .05$).

Measures

Again, the facilities provided demographic information on the youth, including age, race and sex. The same survey measures (i.e. proactive aggression, $\alpha = .68$; McDonald's $\omega = .70$; reactive aggression, $\alpha = .85$; McDonald's $\omega = .87$; and CU traits, $\alpha = .84$; McDonald's $\omega = .85$) were utilized across both studies. Charges information received from the facilities was coded as it was in Study 1 to included sexually based offenses, violent offenses,

Table 4. Study 1: mean indicator variables across profiles.

Variable	Profile 1 (n = 83)	Profile 2 (n = 2)	Profile 3 (n = 15)	Profile 4 (n = 27)	Sample (N = 127)
Reactive aggression	0.54 (0.31)	1.65 (0.07)	1.55 (0.39)	0.95 (0.38)	0.76 (0.48)
Proactive aggression	0.03 (0.05)	1.00 (0.14)	0.47 (0.07)	0.24 (0.05)	0.14 (0.19)
CU traits	1.09 (0.38)	1.96 (0.29)	1.29 (0.33)	1.26 (0.36)	1.16 (0.39)
Classification probability for the most likely latent class membership	.99	1.00	.99	.96	—

Note: Greatest mean scores are in bold. Standard deviations in parentheses. CU = callous-unemotional.

drug-related offenses, theft-related offenses, weapons-related offenses, severity of charge and the number of different types of charges. However, in Study 2, a new code for disorderly offenses was added. This code was meant to capture charges that were minor in nature and were not definitively categorized into any other crime typology code. Examples include: failure to appear, disorderly conduct and flee/attempt to elude. Information about the charges in Study 2 can be found in Table 2.

Procedure

The same procedure was implemented across both studies except for a few notable differences. As in Study 1, youth were required to participate in the survey as a part of standard data collection procedures at the facility. However, in Study 2, due to the inclusion of other research-specific questions as part of the larger assessment battery, youth were asked at the end of the survey whether they would like to assent to their answers being used for research. The assent process was at the end of the survey to ensure youth knew who would have access to their information and for what purpose. Data were collected at Facility 1 from June 2017–January 2019, and at Facility 2 from January 2017–2019 . The survey battery was administered as soon as possible following the youth's arrival into their respective facility. Within Facility 1, interviews typically occurred within 24 hours, while interviews within Facility 2 typically occurred within 48 hours due to staffing and transportation constraints. Four youth were detained at both facilities, and their information from the first survey was retained in the final dataset.

Results

The data analysis for Study 2 followed the same procedure as that for Study 1. Fit statistics for Study 2 can be found in Table 7. All fit statistics continued to improve as additional profiles were added. The LMR and BLRT

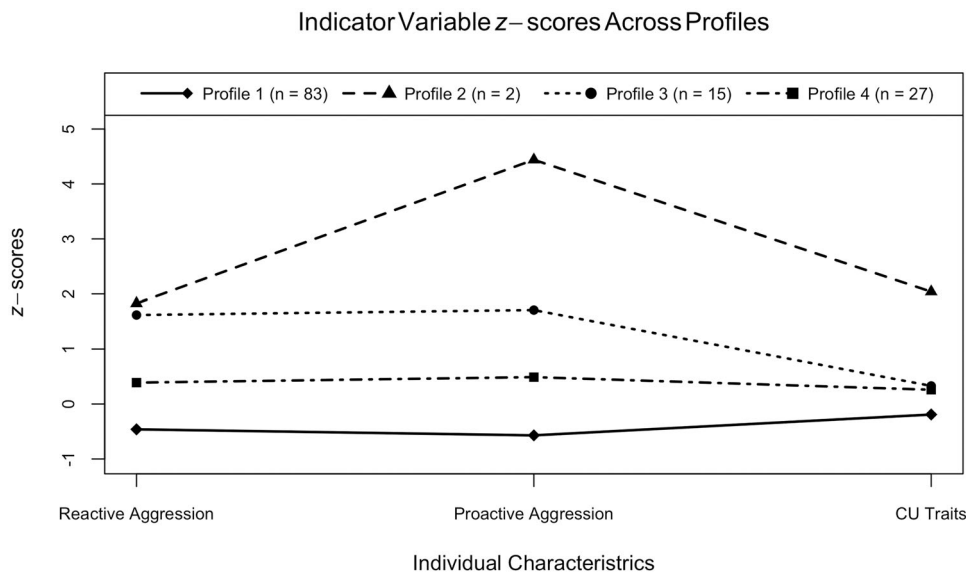


Figure 1. Study 1: four profile solution. CU = callous-unemotional.

statistics contradicted each other, such that the LMR p -value was consistently greater than .05, indicating the current model was not an improvement over a model with one less class, whereas the BLRT remained at $p < .05$, indicating that the current model improved fit over the previous one. Not reaching a non-significant value is a known limitation of the BLRT test (Ferguson et al., 2020). After the four-profile model, subsequent models resulted in a nonidentification error, suggesting that model statistics, including the standard errors and resulting p values, may not be trustworthy. Thus, the five-factor model was not considered a viable option for model selection. Again, while the four-profile group included profiles with relatively few people, their higher scores were considered potentially meaningful. Thus, due to theoretical considerations and fit optimization, the four-profile model was retained.

A similar pattern of profiles was identified in Study 2: Profile 1, 'Low' ($n = 208$; 77.32%); Profile 2, 'Extreme', ($n = 6$; 2.23%); Profile 3, 'High Aggression' ($n = 11$; 4.09%);

and Profile 4, 'Moderate' ($n = 44$; 16.36%). The mean scores on the indicator variables across Study 2 profiles can be found in Table 8, and the z -scores are graphed in Figure 2.

Profiles' relation to charges

In terms of relation to charges, the results of Study 1 were replicated. Fisher's exact tests revealed that profiles were not associated with status as a CINC, the characteristics or types of charges individuals received or demographic variables (see Table 9).

Discussion

The current studies used LPA to identify profiles of youth based on individual characteristics (e.g. proactive aggression, reactive aggression, CU traits) and to determine whether these profiles related to differing crime types in two samples of juvenile offenders. These analyses were novel and exploratory in nature, while research has identified characteristics that are meaningfully related to offending behavior, including proactive and reactive aggression and CU traits

Table 5. Study 1: demographic variables by profiles.

Dichotomous variables	Profile 1 (<i>n</i> = 83)		Profile 2 (<i>n</i> = 2)		Profile 3 (<i>n</i> = 15)		Profile 4 (<i>n</i> = 27)		Total (<i>N</i> = 127)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Male	61	73.5	2	100.0	10	66.7	20	74.1	93	.892
White	44	53.0	1	50.0	5	33.3	14	51.9	64	.566
Sex charge	12	14.5	0	0.0	0	0.0	1	3.7	13	.256
Violent charge	27	32.5	1	50.0	7	46.7	13	48.1	48	.352
Drug charge	21	25.3	1	50.0	0	0.0	5	18.5	27	.068
Theft charge	24	28.9	0	0.0	5	33.3	9	33.3	38	.888
Weapons charge	20	24.1	0	0.0	2	13.3	4	14.8	26	.692
CINC	9	10.8	0	0.0	3	20.0	2	7.4	14	.650
Misdemeanor	32	38.6	1	50.0	6	40.0	13	48.1	52	.803
Continuous variables	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	16.2	1.5	15.5	0.7	15.4	1.6	15.4	2.0	15.9	.083
Number of charges	1.3	0.9	1.0	0.0	0.9	0.8	1.2	0.8	1.2	.746

Note: CINC = child in need of care. For dichotomous variables, Fisher's Exact test was used to examine whether there were differences between profiles. For age, Kruskal-Wallis test was used due to non-normality. For number of charges, a Poisson regression was used. For severity of charge, percentage of individuals represents those that were charged with a misdemeanor. The remainder either were charged with felonies (*n* = 60) or had no charge information (*n* = 15; not included in analysis).

Table 6. Study 2: correlation table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Facility															
2. Race	.06														
3. Sex	-.06	-.16**													
4. Age	-.10	.06	.01												
5. Days in detention	.28***	.13*	-.07	-.16*											
6. Reactive aggression	.01	-.04	-.03	-.05	.08										
7. Proactive aggression	-.06	-.04	-.04	.00	.03	.69***									
8. CU traits	-.05	-.01	-.04	.05	.05	.26***	.24***								
9. Sex charge	.12	-.01	-.17**	-.14*	.06	-.17**	-.06	-.12							
10. Violent charge	.04	.04	-.11	.01	-.01	.06	.10	-.03	-.20**						
11. Drug charge	-.15*	.10	-.06	.03	.02	.07	.09	-.04	-.08	-.17**					
12. Theft charge	.09	.13*	-.19**	.15*	.07	.07	-.04	.00	-.15*	.07	-.04				
13. Weapon charge	.15*	.09	-.21***	-.07	.04	-.08	-.01	-.08	.34***	.35***	-.14*	.15*			
14. Disorderly charge	-.18**	.02	-.07	.03	-.21***	.05	.03	.10	-.19**	-.27***	-.01	-.12	-.22***		
15. CINC	-.19**	-.17**	.34***	.03	.08	-.07	-.08	.06	-.17**	-.32***	-.08	-.27***	-.30***	-.20**	
16. Number of charges	.06	.16*	-.36***	.02	-.03	-.04	.02	-.06	.23***	.50***	.05	.47***	.73***	.11	-.63***
<i>M</i>				15.59	63.86	0.65	0.10	1.07							
<i>SD</i>				1.38	77.63	0.53	0.19	0.40							

Note: CU = callous-unemotional; CINC = child in need of care. Facility is coded Facility 1 = 0, Facility 2 = 1. Race is coded 1 = racial minority, 0 = White. Sex is coded 0 = male, 1 = female. CINC is coded 0 = not a CINC, 1 = CINC. Charges are coded 0 = no, 1 = yes. For number of charges, $M = 1.19$, $SD = 0.87$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

(e.g. Card & Little, 2006; Marsee & Frick, 2007). Importantly, results of the LPA were largely similar across both studies, suggesting that the resulting groups are robust across samples and time. In both studies, the LPA identified four profiles based on differing levels of individual characteristics. This finding is consistent with prior work examining risk factors within Moffit's developmental taxonomy, where differences between life course persistent and adolescent limited offending patterns differed in the magnitude of risk factors rather than in type of risk factors present (Jolliffe et al., 2017). The low profile represented youth who scored below the mean on all characteristics and comprised over half of the sample. In contrast, the extreme profile included youth who scored high on all characteristics, especially proactive aggression, and CU traits but only represented a little over 1% of youth across studies. Within the two remaining profiles, levels of CU traits were similar, while levels of aggression differed, with the high aggression profile demonstrating higher levels of both proactive and reactive aggression than the moderate profile. Notably, across both studies, as the mean scores on individual characteristics increased, the number of youths in each profile decreased. It could be that, while youth who exhibit greater levels of aggression and CU traits may represent unique groups, highly aggressive and callous youth are relatively limited, even in a sample of detained juvenile offenders.

Interestingly, while these distinct groups garnered the best fit for the data, levels of proactive and reactive aggression and CU traits appeared to co-occur at similar levels in the majority of latent class profiles. While it was possible for profiles to differ more drastically, such that profiles could have been identified wherein high levels of one characteristic were grouped with low levels of one or two of the other characteristics, that was not the case in the current studies. Thus, it appears that profiles identified here differed in degree of characteristic (e.g. low, medium, high) rather than

type of offender (e.g. predominantly proactive, etc.). The relatively similar levels of individual characteristics within the majority of identified profiles coincide with previous research demonstrating that proactive and reactive aggression are highly associated (e.g. Card & Little, 2006). Similarly, CU traits have also been associated with increases in both proactive and reactive aggression (e.g. Marsee & Frick, 2007), with more robust and unique associations with proactive aggression. This finding may provide further support for researchers to consider methods, such as LPA, that model characteristics in tandem. While prior research has used generalized linear models to examine the unique predictive ability of factors such as proactive aggression, reactive aggression and CU traits, these models rarely account for the combined ability of these traits to confer risk for offending behavior. However, the current study supports prior literature noting that these factors often occur together within an individual, suggesting that analyses that can better account for the multitude of characteristics possessed by an individual may yield meaningful discoveries.

Of note, CU traits appeared to differentiate less consistently between groups across studies. Specifically, in Study 1, levels of CU traits more closely followed the levels seen in proactive and reactive aggression, such that mean levels of CU traits consistently clustered at low, moderate and high levels. However, in Study 2, levels of CU traits followed patterns less consistently. For example, the level of CU traits in the high group was lower than the level of CU traits in the moderate group. While high levels of CU traits have consistently been linked to poorer outcomes (e.g. severe and persistent antisocial behaviors), as previously mentioned, the actual prevalence of the *Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition* (DSM-5) (American Psychiatric Association, 2013) specifier of 'with Limited Prosocial Emotions', which reflects CU traits, has been found to be low even in a large sample of detained youths

Table 7. Study 2: fit statistics of each of the LPA models.

Number of profiles	Log likelihood	AIC	BIC	SABIC	Entropy	Smallest class(%)	LMR <i>p</i>	LMR meaning	BLRT <i>p</i>	BLRT meaning
1	-285.18	582.35	603.92	584.90	—	—	—	—	—	—
2	-148.27	316.54	352.48	320.78	.97	7	.19	2 < 1	.00	2 > 1
3	-80.16	188.32	238.65	194.26	.95	4	.19	3 < 2	.00	3 > 2
4	-49.47	134.94	199.65	142.58	.96	2	.23	4 < 3	.00	4 > 3
5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: LPA = latent profile analysis; AIC = Akaike's information criterion; BIC = Bayesian information criterion; SABIC = sample adjusted BIC; LMR = Lo, Mendell, and Rubin test; BLRT = bootstrap likelihood ratio test. Favorable fit statistics are in bold. NA = not applicable due to nonidentification error.

(14.2%; Kimonis et al., 2014). LPAs and other forms of exploratory, person-centered analyses (Ferguson et al., 2020) are vulnerable to sample specific variance, hence the importance of replication. These results suggest that functions of aggression may be the driving force of group membership and are perhaps important distinctions amongst offending juveniles.

Despite the advantage of considering the co-occurrence of multiple factors at one time, exploratory associations between latent profiles and charges across studies were all non-significant. This finding was in contrast to hypotheses that profiles with higher levels of aggression and CU traits would be associated with violent offenses. While it is reasonable to hypothesize that the predominant use of a certain function of aggression may confer risk for a specific type of crime, as discussed above, resulting profiles tended to include both functions of aggression in similar amounts. It could be that situational or environmental characteristics, such as neighborhood safety (Raleigh & Galster, 2015; Toomey et al., 2012) or peer influences (Thomas, 2015), and emotional states (Farrington, 2020), may better account for type of crime engaged in, rather than underlying personality features of juvenile offenders. This finding is consistent with literature examining criminal versatility and specialization, wherein it would be expected for underlying individual characteristics to result in a variety of crime types (DeLisi et al., 2019; Farrington et al., 1988). Similarly, research suggests that youth are less likely to have 'specialized' in a specific crime type (e.g. Piquero et al., 1999). It could be that while profiles of individual characteristics could be useful in adult populations, the individual characteristics of youth have not developed to confer risk for offending in the same way as it has solidified in adult offenders.

Further, it was expected CINC status youth would cluster in profiles with lower rates of proactive and reactive aggression and CU traits, but this hypothesis was not supported. CINC's were retained in analyses in order to

Table 8. Study 2: mean indicator variables across profiles.

Variable	Profile 1 (<i>n</i> = 208)	Profile 2 (<i>n</i> = 6)	Profile 3 (<i>n</i> = 11)	Profile 4 (<i>n</i> = 44)	Sample (<i>N</i> = 269)
Reactive aggression	0.47 (0.35)	1.97 (0.43)	1.81 (0.44)	1.04 (0.45)	0.65 (0.53)
Proactive aggression	0.02 (0.04)	0.96 (0.20)	0.55 (0.10)	0.26 (0.08)	0.10 (0.19)
CU traits	1.01 (0.37)	1.40 (0.49)	1.13 (0.29)	1.30 (0.43)	1.07 (0.40)
Classification probability for the most likely latent class membership	.98	1.00	.98	.92	

Note: CU = callous-unemotional. Favorable fit statistics are in bold. Standard deviations in parentheses.

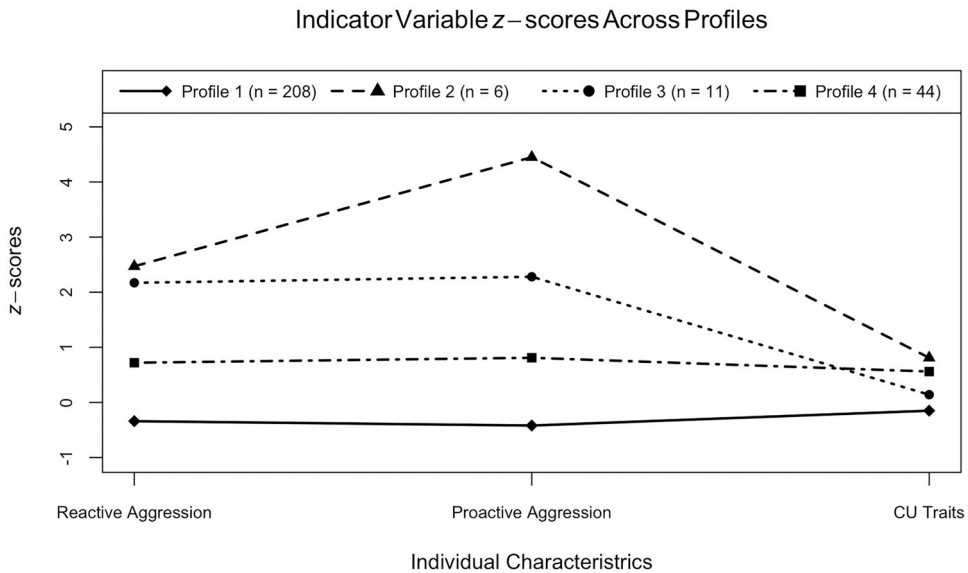


Figure 2. Study 2: four profile solution. CU = callous-unemotional.

provide information on whether having a charge at all was associated with profile membership. Further, it is common practice in counties to hold CINC in detention centers; thus, understanding their individual characteristics within this context is meaningful. Notably, there are high rates of crossover between the juvenile justice and child welfare system, with estimates of dual involvement ranging from 42% to 89% of youth in the juvenile justice system also represented in the child welfare system (Halemba & Lord, 2005; Halemba & Siegel, 2011; Halemba et al.,

2004). Given this high rate of crossover, it could be that youth who have a CINC status present with similar characteristics as justice-involved youth.

It could also be that individual characteristics may be more related to methods and/or motivation for committing a crime rather than the type of crime committed. For example, youth high in CU traits may be skillful at committing crimes by manipulating others to achieve a desired goal, but CU traits do not determine the nature of that goal (e.g. violent, drug). For instance, in a sample of adolescent

Table 9. Study 2: demographic variables by profiles.

Dichotomous variables	Profile 1 (<i>n</i> = 208)		Profile 2 (<i>n</i> = 6)		Profile 3 (<i>n</i> = 11)		Profile 4 (<i>n</i> = 44)		Total (<i>N</i> = 269)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Male	149	71.6	5	83.3	6	54.5	32	72.7	192	.597
White	97	46.6	3	50.0	6	54.5	20	45.5	126	.922
Facility 1	98	47.1	3	50.0	6	54.5	24	54.5	131	.788
Sex charge	22	10.6	0	0.0	1	9.1	3	6.8	26	.912
Violent charge	60	28.8	4	66.7	4	36.4	14	31.8	82	.203
Drug charge	8	3.8	1	16.7	1	9.1	4	9.1	14	.100
Theft charge	46	22.1	0	0.0	2	18.2	7	15.9	55	.623
Weapons charge	49	23.6	2	33.3	1	9.1	13	29.5	65	.511
Disorderly conduct	48	23.1	1	16.7	1	9.1	11	25.0	61	.814
CINC	46	22.1	0	0.0	2	18.2	6	13.6	54	.494
Misdemeanor	57	27.4	4	66.7	3	27.3	13	29.5	77	.482
Continuous variables	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	15.6	1.4	14.7	1.4	15.9	1.7	15.7	1.4	15.6	.230
Number of charges	1.2	0.9	1.3	0.5	1.1	0.6	1.3	0.8	1.2	.729

Note: CINC = child in need of care. For dichotomous variables, Fisher's Exact test was used to examine whether there were differences between profiles. For age, Kruskal-Wallis test was used due to non-normality. For number of charges, a Poisson regression was used. For severity of charge, percentage of individuals represents those that were charged with a misdemeanor. The remainder either were charged with felonies (*n* = 127) or had no charge information (*n* = 65).

males, Thornton et al. (2015) found that CU traits were associated with committing offenses in a group (e.g. gangs), identifying as the leader of the group and, for white participants, with more planning involved in group offenses (Thornton et al., 2015). Similarly, Lawing et al. (2010) found that adolescent sex offenders scoring higher on CU traits engaged in more planning of their sex offenses. In regards to aggression, while manslaughter and murder charges would both be considered a violent charge, manslaughter may be more closely tied to reactive aggression whereas murder may be more closely related to proactive aggression (Fontaine, 2007). Together past research and results of the current study may suggest that individual characteristics may be related to the methods of the crime rather than to the type of crime committed.

Ultimately, these findings may highlight fundamental differences between psychology and the law. While psychologists attempt to explain and describe behavior, legal context seeks to judge the outcomes of these behaviors for culpability (Fontaine, 2007). For instance, distinctions between reactive aggression, proactive aggression and CU traits may speak more to level of culpability rather than differing crime type. However, the limited congruence between psychology and the law is not necessarily problematic, provided that the differing goals between the systems are acknowledged and accounted for in the screening and treatment of justice-involved youth. In other words, knowing that a youth committed a violent offense does not necessarily inform the course of remediation efforts. The juvenile justice system was founded on rehabilitative principles. As such, connecting youth to appropriate services is an essential function of the juvenile justice system. While preliminary, these findings suggest that using legal nomenclature (e.g. charges) may not be appropriate for determining the services youth may need or delineate the individual challenges and/or strengths that youth possess. Accordingly,

integrating effective screening and assessment for mental health concerns is vital to connecting youth to appropriate services within the juvenile justice system. Treatment goals may not be best informed through the examination of type of crime committed.

Limitations and future directions

The current study should be considered in light of its limitations. First, the sample size across studies, while consistent with previous literature using LPAs (McCuish et al., 2015; Odgers, 2007), is relatively small. Notably, without any prior LPAs to guide hypotheses, estimating the power for the LPAs across studies was not possible, as power is dependent on the number of profiles and distance between them (Ferguson et al., 2020). In both studies, while the final models were robust and theoretically meaningful, some profiles included less than the recommended 5% of the sample. These factors had implications for the follow-up analyses relating group membership to crime type. Namely, more complex analyses, such as the Bolck–Croon–Hagenaars (BCH) method (Bolck et al., 2004; Ferguson et al., 2020), were unable to be performed. Additionally, to account for sample size and preliminary nature of this study, only three individual characteristics were chosen for evaluation in the profiles. These characteristics were chosen based on their interrelatedness and their established associations with crime. Future research with larger sample sizes ($N = 300\text{--}500$) should examine additional contextual characteristics (e.g. peer delinquency, neighborhood characteristics) to create profiles that are more complex and comprehensive. Future research may also examine whether these individual characteristics are related to the methods involved in the crime (e.g. planning, sophistication, cover-up, manipulation of others). Finally, youth were asked to complete a battery of self-report measures in an interview style, which may have resulted in social desirability bias and subsequent

underreporting. Future work could consider using computer-assisted audio to avoid the potential for this phenomenon as well as to gather data across multiple informants.

Additionally, the coding of charge information added to the ambiguity of crime type. While the majority of the sample engaged in only one type of charge, this percentage remained less than 50% of youth, with many youths engaging in more than one type of crime and another significant portion of youth detained without a charge. These coding ambiguities may further speak to the difficulties in predicting crime type from individual characteristics, as it may be expected that many youths within juvenile detention may be detained on multiple charges. However, the lack of specificity may have made it more difficult to detect effects.

Given the exploratory nature of the analyses and concurrent limitations, the current study is considered a preliminary evaluation examining profiles of individual characteristics and their association with different crime types. Unfortunately, because none of the charge severity, number and type were related to the profiles identified in the current study, it is impossible to validate these groups beyond model fit. Future research in this area should continue to replicate these findings with larger sample sizes and more diverse populations, in order to establish a consensus of profiles identified within detained juvenile populations. Additional research would most benefit from the exploration of additional, potentially meaningful factors in predicting crime type, such as peer delinquency (Thomas, 2015) or neighborhood characteristics (Raleigh & Galster, 2015).

Ethical standards

Declaration of conflicts of interest

Casey A. Pederson has declared no conflicts of interest

Rebecca Griffith has declared no conflicts of interest

Sarah Nowalis has declared no conflicts of interest

Paula J. Fite has declared no conflicts of interest

Ethical approval

Study 1: all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (University of Kansas IRB # STUDY0002095) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Data collection for Study 1 was completed as an internal audit for the participating facility, wherein a de-identified database was shared with the study team for research purposes.

Study 2: all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (University of Kansas IRB # STUDY00003495) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Study 1: informed consent was not obtained, consistent with IRB protocol, as the original data collection was not conducted for research purposes.

Study 2: informed consent was obtained from the legal guardian, and all youth provided their assent.

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