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Borderline personality disorder and antisocial traits in justice-involved males: Associations with aggression, violent crime, and adverse childhood experiences

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ABSTRACT

Borderline personality disorder (BPD) and antisocial traits are common in justice-involved samples, but research on their dynamics, precursors, and aftereffects regarding aggressive and violent behavior is scarce. In order to enlarge the current knowledge needed for effective risk assessment and reduction, the present study examined patterns of BPD and antisocial traits in a sample of 315 justice-involved males who had undergone psychological/psychiatric evaluation, focusing on their relations with adverse childhood experiences (ACEs), self-reported physical aggression, as well as officially registered previous and future violent crime. Based on a comprehensive analysis of psychiatric/psychological evaluation reports and individuals' self-ratings, latent class analysis identified three distinct classes with (1) high probability of BPD and antisocial traits ($n = 63$), (2) high probability of antisocial traits only ($n = 150$), and (3) low probability of either ($n = 102$). Compared to the latter, both symptomatic classes were characterized by high ACE burden. Whereas the borderline-antisocial class showed associations with increased self-reported physical aggression but not with convictions for violent crimes, the antisocial class was related to both aggression ratings and registered violent offending. Moreover, elevated ACE scores indicated incremental predictability for physical aggression ratings and violent criminality over class membership. The present findings highlight the need to carefully assess personality disturbances and ACEs in justice-involved populations in order to apply the most effective intervention measures to address each individual's criminogenic needs as accurately as possible.

1. Introduction

Borderline personality disorder (BPD) is not a rare condition in the general population, with epidemiological studies revealing a prevalence of 0.5 % to 5.9 % (e.g., Grant et al., 2008; Lenzenweger et al., 2007). In clinical settings, rates between 10 % for psychiatric outpatients and 15 % to 25 % for inpatients have been reported (Gunderson, 2009; Torgersen, 2005). With regard to justice-involved (offender) populations, even higher estimates have been found, with up to 31.7 % showing full BPD symptomatology, and 93.2 % at least one BPD trait (Black et al., 2007; Conn et al., 2010; Wetterborg et al., 2015). Whereas instability of self-concept, attachment problems, suicidality, and self-harming tendencies are often perceived as most common indicators of BPD, research and clinical practice have also highlighted that individuals with BPD are of increased risk to exert physical aggression towards others (e.g., Sansone and Sansone, 2012; Tate et al., 2022). Moreover, as much as 68 % of men diagnosed with BPD tend to exhibit concurrent antisocial traits (Howard et al., 2008; Paris et al., 2013; Robitaille et al., 2017), defined as personality characteristics deemed undesirable or socially unacceptable within the prevailing cultural norms (Kavanagh, 2018). The co-occurrence of BPD and antisocial traits appears to serve as a robust predictor for physical aggression and violent criminal behavior as seen, for example, in a prospective study spanning 27 years and involving over 300 subjects (Robitaille et al., 2017): offenders diagnosed with BDP coupled with comorbid antisocial traits, were, on average, four times more frequently convicted for violent crimes than individuals with

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either condition in isolation. These results seem to concur with other literature on the topic (Howard et al., 2014; Kolla et al., 2017).

Despite the links among BPD, antisocial traits, aggression and violent crime, respective research is scarce, although a more sophisticated knowledge would be beneficial for prevention and treatment. This may be, at least partly, due to the misperception that BPD would be rather prevalent among women, whereas antisocial and externalizing violent behavior are more commonly attributed towards men, thus creating a blind spot when it comes to examining their dynamics. However, research has given contrasting evidence that there are no significant differences in the prevalence of BPD among men and women (Grant et al., 2008; Storebøa et al., 2020). Sansone and Sansone (2011) stressed that the gender distribution of BPD may not be accurately reflected in most prevalence studies conducted in psychiatric settings, because women with BPD rather engage in self-directed aggression and consequently seek mental health treatment more often than men (thus, being over-represented in clinical populations), whereas men with BPD are more likely to show antisocial features and to end up in forensic care or correctional facilities (thus, being under-represented in clinical populations). It was also stated that men and women with BPD tend to exhibit slightly different behaviors and presentations, which could culminate in different clinical dispositions and result in a sampling bias (Sansone and Sansone, 2011). For example, men with BPD typically exhibited elevated scores on aggression and impulsiveness compared to women (Bayes and Parker, 2017; Sher et al., 2019). In line with the abovementioned associations of BPD with antisocial traits, aggression, and violent crime, the current state of research underscores that BPD must not be underrated or neglected in male forensic populations.

Irrespective of potential gender differences, BPD presentations can considerably differ.

between individuals, based on the number and severity of BPD associated symptoms and possible comorbid conditions (e.g., antisocial traits). Thus, it appears fruitful to investigate BPD not only on a syndromic level, but also respecting distinct symptom occurrences. In order to disentangle the heterogeneity of clinical syndromes on a person-centered level, latent class analysis (LCA) has been proven a useful statistical approach, as it aims at identifying homogeneous, mutually exclusive classes of individuals based on distinct symptom patterns. Several studies have used LCA to determine patterns of BPD and comorbid conditions, such as (complex) post-traumatic stress disorder (PTSD; Cloitre et al., 2014; Frost et al., 2020; Saraiya et al., 2021), attention-deficit/hyperactivity disorder (ADHD; van Dijk et al., 2012), or substance use (Bornovalova et al., 2010). All in all, findings indicated that even when separate classes with predominantly BPD and predominantly non-BPD symptoms occurred, there was a common overlap as well, and outcomes such as functionality differed with respect to individual class assignments, highlighting the need to consider not only disorder categories as such, but also person-centered symptom patterns. To the best of our knowledge, studies on BPD in forensic settings using LCA are missing, particularly with regard to antisocial behavior, aggression, and violent crime.

The origins of BPD are intricate and still unclear. None of the existing etiological models have successfully encompassed all the available evidence (National Collaborating Centre for Mental Health, 2009): Similar to many other psychiatric disorders, the causes of BPD are likely multifactorial, involving genetics and inherent vulnerabilities, dysfunctions in neurophysiology and neurobiology related to emotional regulation and stress, disruptions in the affiliative behavioral system, particularly the attachment system, but also histories of adverse childhood experiences (ACEs). ACEs include, but are not restricted to, encounters with violence, abuse, or neglect within the home or community during childhood and adolescence that may jeopardize an individual's sense of safety, stability, and bonding (Centers for Disease Control and Prevention, 2024). The positive associations of ACEs with BPD have garnered significant attention within the mental health research community (Afifi et al., 2011; Reich et al., 1997). A recent meta-analysis found that individuals with BPD were 3.36 times more likely to report ACEs than psychiatric control groups (Porter et al., 2020). In addition, ACEs, especially their accumulation, have been considered as relevant risk factors for the occurrence and maintenance of antisocial behavior, aggression, and violent delinquency (Almeida et al., 2024; Fox et al., 2015; Jackson et al., 2014; King, 2021). Thus, ACEs appear to influence both the development of BPD as well as antisocial tendencies and violence, thus representing a critical variable of interest to further examine the dynamics among these constructs.

In populations of justice-involved individuals, it is crucial to accurately assess and manage BPD and antisocial traits as well as their precursors and aftereffects in order to effectively evaluate individual risk profiles, which sets the foundation of accordant treatment to support rehabilitation processes and protect the society from further crime. A more comprehensive understanding of the dynamics between BPD, antisocial traits, aggression, and criminal behavior along with predisposing factors such as ACEs, is of specific relevance in this regard.

Under the consideration of the above-mentioned gaps of research, the present study aimed at identifying patterns of BPD and co-occurring antisocial traits in justice-involved males by LCA and investigate their associations with physical aggression, prior, and future violent offending, taking into account the role of ACEs for both symptomatology and behavioral outcomes. Based on the existing literature, we expected to find four latent classes with (a) predominantly BPD traits, (b) predominantly antisocial traits, (c) both BPD and antisocial traits, and (d) low probabilities of either. We assumed that the combined class would be most burdened with ACEs, followed by the BPD and antisocial class. It was also hypothesized that ACEs would positively predict physical aggression and violent crime. Based on previous findings that BPD was often associated with elevated aggression scores in males, that antisocial traits predicted violent crime, and that the co-occurrence of BPD and antisocial traits was highly relevant for both (e.g., Howard et al., 2014; Robitaille et al., 2017; Sher et al., 2019), we expected the combined BPD-antisocial class to relate most strongly to physical aggression and violent crime, whereas the BPD class would show elevated risk of physical aggression but not necessarily violent crime, in contrast to the antisocial class, which was assumed to show the highest risk of violent crime involvement. To what extent a joint consideration of LCA classes and ACEs would influence their single associations with the outcomes was examined in exploratory manner.

2. Methods

2.1. Procedure

The current study was conducted within an ongoing research project investigating the connections between ACEs, mental health, and aggressive behavior in justice-involved males from various angles. The research involved the examination of psychiatric/psychological evaluation reports of a consecutive sample of men referred by the criminal court to the Saarland University's Institute for Forensic Psychology & Psychiatry, Germany, between August 2007 and February 2020 for a pre-trial assessment of criminal responsibility due to a mental disorder or an assessment of risk of recidivism. These evaluations considered (criminal and psychiatric) file information and clinician-administered interviews regarding the individuals' biographies including family dynamics, psychological, physical, and sexual development, as well as health and criminal history. All evaluations had been conducted by forensically trained psychiatrists and/or psychologists. In addition, the justice-involved males had completed a set of self-report questionnaires.

From May 2020 to December 2022, the psychological/psychiatric evaluation reports were retrospectively analyzed by trained psychologists, psychology and medical students, who had not been involved in the original evaluation process. A coding system was used that had been specifically designed for this purpose, based on a similar measure that had been proven beneficial for forensic file analyses (e.g., Barra et al.,

2018, 2021). The coding system included a wide variety of variables considered as relevant in forensic and psychiatric research, such as demographics, crime history, offense analysis, family dynamics, general and sexual development, childhood adversity, and risk assessment (see also Wente et al., 2023; Woehrle et al., 2022). Raters' training included one session for the introduction of the coding system and the associated coding manual by the scientific project manager, who had himself been certified by the authors of the PCL-R to apply this measure. Then, raters independently worked through a training case. A second session was held to discuss the coding and to clarify any questions.

External data coding was then merged with the justice-involved males' self-reports on the relevant questionnaires. Lastly, each individual's violent criminal career was examined using official criminal records provided by the German Federal Office of Justice, obtained between August and November 2022.

Thus, the present study was based on retrospective data analysis based on the information from justice-involved males' evaluation processes that lied in the past and their official criminal records. The assessed males themselves did not have to be personally invited to participate in the current research project, but data selection and analysis without explicit retroactive consent of each individual was in line with the German Code of Criminal Procedure (§476) that allows research institutions to use personal data for scientific purposes. The ethics committee of the medical chamber of Saarland, Germany, approved all study procedures (No. 179/21).

2.2. Sample

The initial sample consisted of 325 justice-involved males. However, for the present study, we only considered data from male individuals who had given complete self-report information on the SCID-II screening questionnaire as well as the aggression questionnaire with an inconsistency responding index lower than 5 (see below). We applied no further exclusion criteria. Thus, a total of 315 justice-involved males aged 16 to 73 years (M = 36.04 years; SD =11.90 years) were included. Of those, 175 (56.6 %) had been evaluated for criminal responsibility, 134 (42.5 %) for risk assessment, and 6 (1.9 %) for other purposes (e.g., arrest ability). As index offenses (those offenses that had led to the psychiatric/psychological evaluations), 139 justice-involved males (44.1 %) had committed a (non-sexual) violent offense, 70 (22.2 %) a hands-on sexual offense, 3 (0.9 %) exclusively a hands-off sexual offense, and 103 (32.7 %) other, non-violent/sexual offenses (e.g., fraud, property damage, or theft). However, when life-time delinquency was considered (prior and index-offenses), 190 individuals (60.3 %) had committed at least one violent (non-sexual) offense, 77 (24.4 %) at least one hands-on sexual offense, and 9 (2.9 %) at least one hands-off sexual offense (overlap possible). On the other hand, 73 (22.5 %) justice-involved males had never been charged/convicted for any violent and/or sexual offense, but exclusively for other crimes (such as theft, fraud, or violations of narcotics laws).

To ensure extracted data were reliable, 30 cases were randomly selected (but stratified for evaluation purpose: criminal responsibility or risk assessment) and independently double-rated in order to calculate inter-rater agreement.

2.3. Measures

2.3.1. Borderline traits

The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (SCID; e.g., First and Gibbon, 2004) is a commonly conducted measure that aims to determine whether an individual meets the criteria for any disorder listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM). Whereas the SCID-I deals with so called DSM-IV Axis I disorders, the SCID-II considers Axis II personality disorders. The SCID-II usually comprises a two-step process: Firstly, participants complete a self-report screening questionnaire, aiming to identify traits associated with the personality disorders covered by the SCID-II. Subsequently, a clinical interview is conducted to further delve into the patients' responses. Agreement with at least 5 BPD traits can be considered as an indicator for clinically relevant BPD symptomatology. For present study, however, we only referred to the justice-involved males' self-ratings with regard to 14 BPD traits (items 89 to 102) on the German version of the SCID-II screening questionnaire (Fydrich et al., 1997). Items were binary rated (yes/no). The usability of the SCID-II screening questionnaire has been proven in prior research for clinical and forensic samples (Ekselius et al., 1994; Ullrich et al., 2008). In the present study, the internal consistency of a composite BPD traits sum score was good (Cronbach's $\alpha = 0.824$).

2.3.2. Antisocial traits

Since the SCID-II self-report screening questionnaire only focuses on antisocial behavior shown in childhood and adolescence, we relied on facet 4 (antisocial) of the German version of the Psychopathy Checklist-Revised (PCL-R; Hare, 2003; Mokros et al., 2017) to gain a somewhat longer term perspective on antisocial traits (up to adulthood) by external coding. The PCL-R consists of a total of 20 items that cover a range of traits associated with the concept of psychopathy according to Hare. Each of the 20 items is evaluated by a trained external rater on a scale of 0 ("not applicable"), 1 ("maybe applicable"), or 2 ("applicable"). The authors of the PCL-R emphasize that coding is possible based on file information only (Mokros et al., 2017). Besides the antisocial facet, there are three further facets: interpersonal, affective, and lifestyle. Whereas the interpersonal and affect facets cumulate to a primary factor reflecting core personality traits of psychopathy, the lifestyle and antisocial facets display a second factor of social deviance.

Facet 4 (antisocial) reflects norm-deviating and crime-associated behavioral patterns that often manifest early in life and persist into adulthood. It includes 5 items: (1) "Poor behavioral control", indicating difficulties in managing anger and frustration, often resulting in frequent displays of aggression and temper outbursts ($\tau = 0.56$); (2) "early behavior problems", indicating a history of significant issues during childhood or adolescence, such as serious rule violations and disruptive behaviors ($\tau = 0.53$); (3) "juvenile delinquency", which involves engagement in criminal activities or serious infractions before the age of 18 ($\tau = 0.62$); (4) "revocation of conditional release", describing a pattern of failing to comply with parole, probation, or other forms of conditional release ($\tau = 0.74$); and (5) "criminal versatility", reflecting the individual's involvement in a wide range of criminal behaviors ($\tau = 0.54$) (Hare, 2003; Mokros et al., 2017). Multiple studies worldwide have pointed to good psychometric properties of the PCL-R, even when only file information was considered (Grann et al., 1998; Hare et al., 2000; Mokros et al., 2011). In the current study, inter-rater agreement was strong for each of the 5 items of the antisocial facet ($\tau > 0.50$).

2.3.3. Physical aggression

Physical aggression was measured by the justice-involved males' self-reports on the German translation of the Aggression Questionnaire (AQ-G; Buss and Warren, 2000; Herzberg, 2003). The AQ-G version used for the present study comprised 34 items which were rated between 1 ("not at all like me") and 5 ("completely like me"). While 8 items represent physical aggression, the remaining items refer to verbal aggression, anger, indirect aggression, and hostility. Subscale scores and an aggression sum score can be built. Moreover, an inconsistency rating can be derived, with scores of at least 5 indicating doubt about trustworthy responses. For the present study, we only included the physical aggression subscale and limited our sample to those with inconsistency ratings below 5 (see above). In general, good psychometric properties were proven for this aggression measure (e.g., Herzberg, 2003; Hornsveld et al., 2009; Maxwell, 2008), although the verbal aggression subscale only showed moderate internal consistency. In the current study, internal consistency for the physical aggression subscale was good (Cronbach's $\alpha = 0.862$).

2.3.4. Adverse childhood experiences

Each individual's history of ACEs during their first 18 years of life was extracted from the evaluation reports relying on the 10 ACE categories (coded binary as yes/no) defined by Felitti, Dube and colleagues (Dube, 2024; Dube et al., 2001; Felitti et al., 1998). While previous research has proven reliable and valid assessment of these ACE categories by self-reports (e.g., Wingenfeld et al., 2011), other studies have shown that ACEs can also be derived from file information only (Barra et al., 2018, 2021; Wente et al., 2023). In the present study, file-based ACE assessment succeeded with predominantly good to very good inter-rater agreement: physical abuse ($\kappa = 0.93$), emotional abuse ($\kappa = 0.63$), physical neglect ($\kappa = 0.60$), emotional neglect ($\kappa = 0.74$), sexual abuse ($\kappa = 1.00$), household violence ($\kappa = 0.85$), household drug use ($\kappa = 0.78$), household mental illness ($\kappa = 0.85$), household crime ($\kappa = 0.76$), and parental separation ($\kappa = 0.93$). For further analyses, a cumulative ACE score was built (ICC = 0.98).

2.3.5. Convictions for violent crime

The justice-involved males' violent criminal careers were evaluated by examining their entries in the German Federal Central Register (Bundeszentralregister; BZR). The BZR is a central official registry managed by the Federal Office of Justice in Germany. The register records any criminal convictions by German courts, specific decisions by administrative authorities, cases on diminished responsibility, and special judicial findings. It also includes subsequent decisions and facts related to these entries. Additionally, foreign convictions against Germans or individuals born or residing in Germany are entered when certain conditions are met.

For the present study, we differentiated between legally binding convictions for violent crime (including hands-on sexual offenses) before and after the psychiatric/psychological evaluation (history of / future convictions for violent offending, respectively) irrespective of their legal consequences. Because data were directly extracted from the register, no inter-rater agreement was calculated. The observation period, defined as the time between the evaluation report and the provision of register information, ranged from 2.39 to 14.63 years (M = 8.13 years, SD = 2.32 years). Notably, BZR data was unavailable for two individuals, reducing the sample to 313 justice-involved males for analyzing their histories of / future convictions for violent crime.

2.4. Statistical analyses

Analyses were conducted in IBM SPSS version 28.0 and Mplus version 8.8 (Muthén and Muthén, 1998-2017) for Windows. First, data reliability was checked by calculating inter-rater agreement and internal consistency. For categorical variables that had been externally rated, Cohen's κ was computed using the following interpretation thresholds (Landis and Koch, 1977): $\kappa \leq 0.20$ slight; $\kappa = 0.21-.40$ fair; $\kappa = 0.41$ - 0.60 moderate; $\kappa = 0.61$ - 0.80 substantial; and $\kappa = 0.81 - 1.00$ almost perfect agreement. For ordinal data, Kendall's τ was utilized with $\tau \leq 0.30$ weak; $\tau = 0.31$ - 0.50 moderate; and $\tau > 0.50$ strong agreement (Cohen, 1988). Externally rated dimensional variables were evaluated using the intra-class correlation coefficient (ICC; two-way random effects based on a single measure, absolute agreement) with ICC ≤ 0.40 reflecting poor; ICC = 0.41 - 0.59 sufficient; ICC = 0.60 - 0.74 good; and ICC > 0.74 excellent agreement (Fleiss, 1981). Additionally, the internal consistency of self-reported dimensional data was assessed using Cronbach's α, with $\alpha \leq 0.60$ being low; $\alpha = 0.61$ - 0.70 questionable; $\alpha = 0.71$ - 0.80 acceptable; $\alpha = 0.81$ - 0.90 good; and $\alpha > 0.90$ excellent (Blanz, 2021).

LCA with robust maximum likelihood estimation was conducted using the 14 items representing BPD traits from the SCID-II self-report screening questionnaire and the 5 items of PCL-R's facet 4 for antisocial traits. Since LCA requires binary coded indicators, items for antisocial traits were recoded as 0 = 0 and 1/2 = 1. We applied a three-step approach as proposed by Nylund-Gibson and Choi (2018). After estimating a basic LCA model based on the abovementioned indicators, the covariates ACEs and age (because of the large age range in our sample) were included, followed by our outcomes of interest, thus, implementing regression models. To find the best fitting basic LCA solution, we started with a one-class model and gradually increased the number of classes. Model fit was identified relying on the Bayesian Information Criterion (BIC; Schwarz, 1978) because, as per Nylund et al. (2007), it has been considered superior over other fit indices, such as the Akaike Information Criterion (AIC; Akaike, 1974) and the sample-size adjusted Bayesian Information Criterion (aBIC; Sclove, 1987). The model exhibiting the smallest BIC is supposed to demonstrate the optimal balance between fit and parsimony. Additionally, significant test statistics of the Lo-Mendell-Rubin Likelihood Ratio Test (LMR LRT; Lo et al., 2001) and the Bootstrapped Parametric Likelihood Ratio Test (BLRT; McLachlan and Peel, 2000), comparing a model with k classes to a model with (k-1) classes, suggest that the incorporation of an additional latent class has improved model fit. The BLRT is deemed the most reliable among the LRTs; it is advisable to initially consider the BIC and turn to the BLRT in instances of uncertainty (Nylund et al., 2007). Entropy, as a measure to assess the quality of classification of individuals to latent classes, was also quantified, with a value greater than 0.80 indicating sufficient classification accuracy (Clark and Muthén, 2009).

3. Results

3.1. Descriptives

On average, 3.01 items that indicate BPD traits on the SCID-II screening self-report questionnaire were affirmed (SD = 3.01, range = 0–14). A great majority of the justice-involved males ($n = 251$, 79.7 %) reported at least one BPD trait, and 76 individuals (24.1 %) agreed to at least 5 items. The mean value of facet 4 (antisocial) of the PCL-R was 4.01 (SD = 2.92, range = 0–10). In reference to the German PCL-R norm sample (Mokros et al., 2017), 25 justice-involved males (7.9 %) of the present study reached the above-average range ($T \geq 60$). See Table 1 for the distribution of binary coded BPD and antisocial traits. Physical aggression self-reports on the AQ-G ranged between 8 and 38 (M = 14.58, SD = 6.28). The cumulative ACE score showed a mean 3.16 (SD = 2.68, range = 0 – 9). The most common type of ACE was emotional neglect ($n = 178$, 56.6 %), followed by parental separation ($n = 137$, 43.5 %), and emotional abuse ($n = 128$, 40.6 %). A total of 237

Table 1
Agreement to BPD and antisocial traits.

	Item (number)	n	%
SCID-II Borderline	Fear of being left (89)	141	44.8
	Relationship inconsistency (90)	78	24.8
	Sudden change of plans/sense of self (91)	128	40.6
	Extreme change in self-perception (92)	53	16.8
	Sudden change of goals/opinions (93)	31	9.8
	Impulsiveness (94)	78	24.8
	Threats or attempts of self-harm/suicide (95)	86	27.3
	Intentionally cut, burned or scratched (96)	62	19.7
	Moodiness (97)	75	23.8
	Inner emptiness (98)	86	27.3
	Rage outbursts (99)	23	7.3
	Acting out anger on others/things (100)	25	7.9
	Becoming angry by little things (101)	34	10.8
	Feeling wary or unreal under pressure (102)	48	15.2
PCL-R Facet 4 (antisocial)	Poor behavioral control (10)	228	72.4
	Early behavioral problems (12)	161	51.1
	Juvenile delinquency (18)	134	42.6
	Revocation of conditional release (19)	115	36.5
	Criminal versatility (20)	130	41.3

Note. N = 315. PCL-R coding was dichotomized as 0 = 0 and 1/2 = 1.

justice-involved males (75.2 %) had a history of convictions for violent offending (including hands-on sexual offenses), whereas future convictions for violent offenses had been registered for 45 individuals (14.3 %).

3.2. Latent class analysis

Models with one to six latent classes were compared (see Table 2). The 3-class solution stood out for the smallest BIC value. Furthermore, although the BLRT turned out significant for all models, the LMR LRT affirmed the superiority of the 3-class solution over the 2-class alternative, but did not point to the necessity to include any more latent classes. Furthermore, the 3-class model showed sufficient entropy. Taking into account the entirety of model fit assumptions and interpretability, we decided to select the 3-class model for subsequent analyses (see Fig. 1).

Class 1 consisted of 63 individuals (20.0 % of the total sample) who exhibited a combination of BPD and anti-social traits, thus labeled borderline-antisocial. Class 2 included 150 individuals (47.6 % of the total sample) who primarily displayed antisocial traits with minimal BPD characteristics, thus labeled antisocial. Class 3 comprised 102 individuals (32.4 % of the total sample) with a low probability of exhibiting either BPD or antisocial traits, thus labeled low-symptom.

Two basic regression approaches were conducted: one comparing the borderline-antisocial and the antisocial class with the low-symptom class, and another comparing the borderline-antisocial class with the antisocial class as reference group.

First examining the effects of the covariates ACEs and age on class membership, it was found that - in contrast to the low-symptom class - increasing ACEs predicted assignments to both the borderline-antisocial (OR = 1.31, 95 %-confidence interval (CI) [1.14, 1.52]; $p < .001$) and the antisocial class (OR = 1.31, 95 %-CI [1.14, 1.51]; $p < .001$). Age, however, was negatively associated with the assignment to the borderline-antisocial (OR = 0.94, 95 %-CI [0.91, 0.98]; $p = .003$) and the antisocial class (OR = 0.94, 95 %-CI [0.92, 0.97]; $p < .001$) when compared to the low-symptom class. Contrasts between the borderline-antisocial and the antisocial class showed no significant differences, neither for the effect of ACEs (OR = 1.00, 95 %-CI [0.89, 1.12]; $p = .974$) nor age (OR = 1.00, 95 %-CI [0.97, 1.04]; $p = .929$).

With regard to the outcomes of interest, self-reported physical aggression was associated with increasing ACE scores (estimate = 0.14, SE = 0.062, estimate/SE = 2.24, $p = .025$) but lower age (estimate = −0.04, SE = 0.014, estimate/SE = −2.63, $p = .008$). A history of convictions for violent crime was also significantly related to higher ACE scores (OR = 1.18, 95 %-CI [1.07, 1.31]; $p = .001$), but not to age (OR = 0.99, 95 %-CI [0.97, 1.01]; $p = .207$). Future convictions for violent crime, on the contrary, were not predicted by ACE scores (OR = 1.07, 95 %-CI [0.95, 1.21]; $p = .243$), yet negatively associated with age (OR = 0.97, 95 %-CI [0.94, 0.99]; $p = .014$).

Table 3 displays the regression models for the prediction of self-rated physical aggression and history of / future convictions for violent crime by class membership without and with consideration of covariates. Both the borderline-antisocial and antisocial class were at higher risk of physical aggression than the low-symptom class. Moreover, physical aggression rates were higher in the borderline-antisocial than in the antisocial class. Those associations remained stable under consideration of ACEs and age. The antisocial but not the borderline-antisocial class showed elevated risk for a history of and future convictions for violent crime in comparison to the low-symptom class. However, no significant differences emerged between the two symptomatic classes, and associations between the antisocial class and violent crime outcomes did not remain when covariates were included.

Table 2
Model parameters of LCA models with increasing number of latent classes (n = 315).

Model	BIC	p (LMR LRT)	p (BLRT)	Entropy
1-class	6437.38	–	–	–
2-class	5954.73	0	0	.86
3-class	5848.64	.005	0	.84
4-class	5858.51	.120	0	.83
5-class	5867.43	.126	0	.88
6-class	5920.58	.184	0	.87

4. Discussion

The current study aimed at enhancing the understanding of BPD characteristics and their co-occurrence with antisocial traits in justice-involved males, considering the dynamics of both conditions with physical aggression, convictions for violent crime, and ACEs. Using LCA, we identified three distinct classes based on BPD and antisocial trait patterns that were differently related to ACEs and aggressive/violent outcomes.

Whereas about one-third-of the total sample showed low probabilities of BPD and antisocial traits (low-symptom class), two-thirds were distributed over two distinct symptom classes: Almost half of all justice-involved males showed elevated probabilities of antisocial traits (antisocial class) and every fifth was assigned to a class with high comorbidity of BPD and antisocial traits (borderline-antisocial class). Contrary to our expectations, we could not identify a separate class characterized by BPD traits only. However, prevalence of BPD traits was high, with about four fifths of the sample reporting at least one and nearly one-quarter affirming a minimum of 5 BPD items. The current findings are in accordance with previous research pointing to elevated rates of BPD traits in justice-involved compared to clinical and community samples (Black et al., 2007; Conn et al., 2010; Wetterborg et al., 2015). They also emphasize that BPD traits are often accompanied by antisocial traits in justice-involved populations (Howard et al., 2008; Paris et al., 2013; Robitaille et al., 2017) and contribute to the 'severe 5 %' research postulating that there is a small proportion of cases that stand out for increased risk of psychopathology and serious (and persistent) antisocial conduct (e.g., Vaughn et al., 2011). Still, the majority of the present sample was assigned to the class with antisocial traits without BPD symptomatology, which might have been due to the fact that our sample was rather heterogeneous with regard to their mental health backgrounds, including justice-involved males with and without the need of (forensic) psychiatric care.

Interestingly, both symptomatic classes showed comparable probabilities for acting out anger as assessed by the SCID-II screening questionnaire. However, whereas for the antisocial class, this item ranged among the most relevant BPD traits, it appeared of rather less importance compared to other BPD traits in the borderline-antisocial class. Consequently, it was not surprising that both classes showed elevated risk of physical aggression measured by the AQ-G compared to the low-symptom class, which corresponds with previous findings (e.g., Robitaille et al., 2017; Sansone and Sansone, 2012). Yet, the borderline-antisocial class also stood out for elevated physical aggression ratings with reference to the antisocial class, which might be explainable by greater risk of emotional instability, impulsiveness, or relationship problems that can contribute to externalizing (physical) aggression towards others (e.g., Sansone and Sansone, 2012).

On the contrary, self-rated physical aggression did not seem to be reflected by officially registered convictions for violent crime. Not the borderline-antisocial, but the antisocial class showed increased probabilities for a history of and future convictions for violent crime compared to the low-symptom class, although differences between the two symptomatic classes did not reach statistical significance. On the one hand, our findings support prior notions about the predictive value of antisocial traits regarding violent offending (e.g., Walters et al., 2008). On the other hand, differences to self-reported physical aggression ratings may be attributable to possible variations in the circumstances of aggressive / violent behavior in the case of BPD in contrast to more general antisocial tendencies apart from BPD. For instance, the

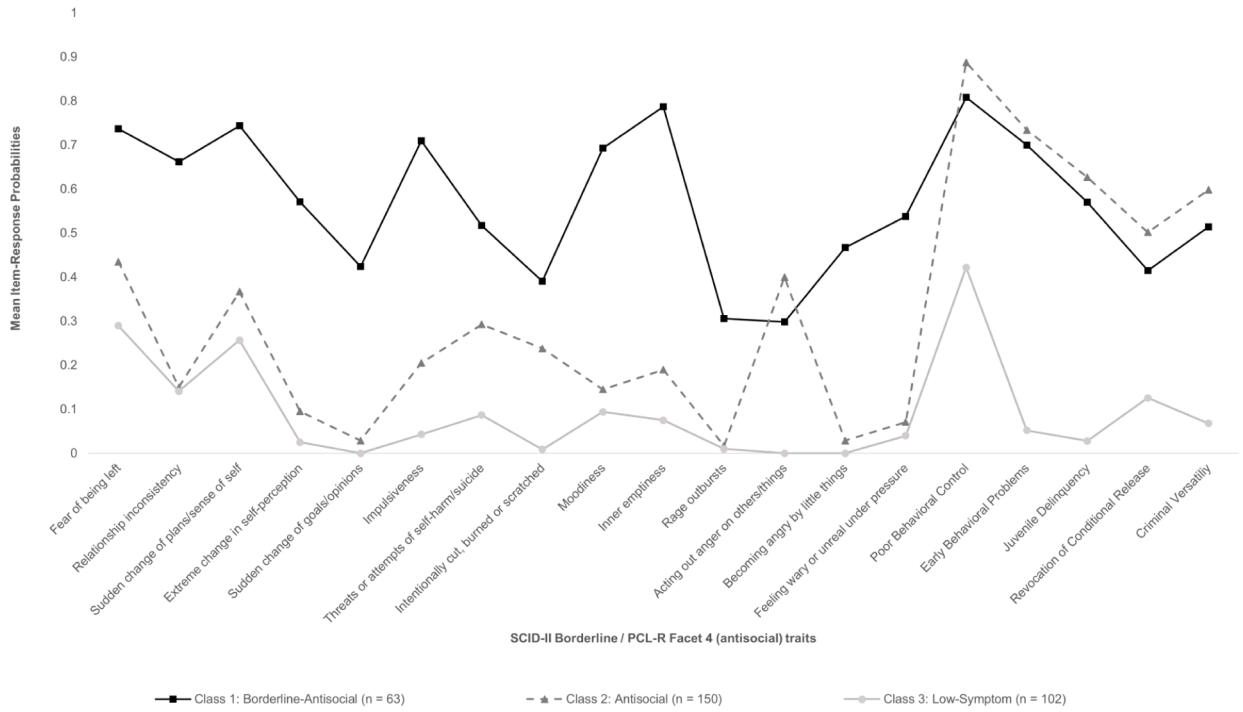

Fig. 1. Three-class solution of the latent class analysis based on mean item-response probabilities.

Table 3
Regression models for the prediction of physical aggression, history of and future violent offending.

		Physical aggression			History of convictions for violent crime			Future convictions for violent crime		
		OR	95 %*CI*	*p*	*OR*	95 %*CI*	*p*	*OR*	95 %*CI*	*p*
Model 1a (reference: low-symptom)	Borderline-Antisocial	1.53	1.28–1.84	< 0.001	1.21	0.58–2.50	.609	2.16	0.67–6.94	.196
	Antisocial	1.18	1.07–1.30	.001	2.46	1.25–4.87	.009	3.25	1.17–9.02	.024
Model 1b (reference: antisocial)	Borderline-Antisocial	1.30	1.10–1.54	.002	0.49	0.22–1.08	.077	0.67	0.26–1.69	.391
Model 2a (reference: low-symptom)	Borderline-Antisocial	1.50	1.25–1.82	<0.001	0.90	0.40–2.02	.798	1.51	0.51–4.49	.455
	ACEs	1.27	1.09–1.49	.002	1.32	1.14–1.53	< 0.001	1.31	1.13–1.51	< 0.001
	Age	0.95	0.91–0.99	.021	0.94	0.91–0.98	.003	0.94	0.91–0.98	.004
	Antisocial	1.15	1.03–1.29	.012	1.86	0.85–4.07	.151	2.52	0.99–6.40	.052
	ACEs	1.30	1.14–1.50	<0.001	1.29	1.12–1.48	< 0.001	1.30	1.13–1.49	< 0.001
	Age	0.94	0.92–0.97	<0.001	0.94	0.92–0.97	< 0.001	0.94	0.92–0.97	< 0.001
Model 2b (reference: antisocial)	Borderline-Antisocial	1.30	1.11–1.53	.002	0.48	0.22–1.07	.073	0.60	0.26–1.41	.240
	ACEs	0.98	0.86–1.11	.704	1.02	0.91–1.15	.721	1.01	0.90–1.13	.894
	Age	1.01	0.97–1.05	.626	1.00	0.96–1.04	.989	1.00	0.96–1.04	.990

perpetration of aggression or violence against others related to BPD may rather occur in private, in intimate and/or other close relationships, increasing the risk that suchlike occasions may be self-reported as physically aggressive acts, although not appearing in official crime registers but remaining in the dark figure of crime (e.g., Sansone and Sansone, 2012; White et al., 2024). Moreover, physical aggression as assessed by the aggression questionnaire may rather refer to a more general urge to behave aggressively without actually conveying this to the outside world. Eventually, individuals burdened with BPD traits could also have received more accurate and effective treatment to reduce the risk of engaging in aggression and violence that actually exceeded juridical thresholds; however, respective treatment studies that include official crime data are rare (Stewart et al., 2019).

In addition, the role of ACEs must not be neglected. Our findings that both the borderline-antisocial and the antisocial class showed increased ACE burden compared to the low-symptom class contributed to prior research highlighting the etiological role of ACEs for both BPD and antisocial traits (e.g., Almeida et al., 2024; Fox et al., 2015; Jackson et al., 2014; King, 2021; Porter et al., 2020). Yet, symptomatic classes did not significantly differ from each other regarding cumulative ACEs, which was against our hypotheses but illustrates that ACEs display relevant risk factors for multiple maladaptive outcomes relevant in forensic psychiatry and psychology (Craig et al., 2017; Dube, 2024; Fox et al., 2015). In line with this statement, an increasing number of ACEs was associated with elevated risk of physical aggression and a history of convictions for violent crime, with and without consideration of BPD and antisocial traits. Although not predicting future convictions for violent crime per se, ACEs showed incremental predictabily for future violent offending for the borderline-antisocial and antisocial class in contrast to the low-symptom class.

Eventually, age did also influence the present dynamics. Assigments to both symptomatic classes was more probable for younger justice-involved males, and, in accordance with current knowledge (e.g., Piquero et al., 2015), physical aggression ratings and risk of future

convictions for violent crime were greater when individuals were younger. The lacking significance regarding the link between age and a history of convictions for violent crime may, at least partly, due to the fact that younger justice-involved males simply had less time to commit violent offenses before the psychiatric/psychological evaluation. However, when contrasting LCA models, younger age also showed a significant influence for the prediction of future convictions for violent crime.

The present results need to be interpreted in the light of several limitations. While the study focused on justice-involved males' patterns of BPD and antisocial traits, we did not include clinician-assured diagnoses of BPD or antisocial personality disorder (ASPD) which reduced the comparability with other studies that did so (e.g., Robitaille et al., 2017). Moreover, other psychiatric syndromes that often co-occur with BPD and appear to be of specific forensic interest were not considered (such as ADHD; van Dijk et al., 2012; Retz et al., 2021; Tate et al., 2022). Additionally, we did not exclude any individuals based on their mental condition, although (severe) cases of psychosis or intellectual disability may have influenced self-reports. Generalizability of the findings is further limited because we only assessed data from justice-involved males seen at one forensic institute in Germany. There is an ample discussion about gender-related differences in BPD prevalence and presentations (e.g., Bayes and Parker, 2017; Grant et al., 2008; Sansone and Sansone, 2011; Sher et al., 2019; Storebøa et al., 2020) that we could not further illuminate by only examining males. Future studies would benefit from including justice-involved individuals of all genders to gain a more sophisticated knowledge on the dynamics among ACEs, BPD, antisocial traits and aggression/crime. Both self-reported and externally rated data hold the risk of bias due to social desirability (which must be expected to some degree when justice-involved populations are evaluated; e.g., Wente et al., 2023) or insufficient databases, respectively. Bias might have been reduced by relying on only one type of data assessment (either self-reports or clinical judgment); however, as mentioned above, (1) we could not include clinician-administered BPD assessment, and (2) antisocial behavior captured by the SCID-II screening questionnaire only referred to childhood and adolescence although we aimed to include longer term antisocial conduct. It must also be addressed that results may be biased, at least to some extent, due to methodological issues, e.g. different sample sizes in derived latent classes.

However, the reliability of our constructs of interests supports their usability for the present study. Yet, it has to be mentioned that although scores of $\tau > 0.50$ indicate strong agreement (Cohen, 1988), inter-rater reliabilities for the PCL-R were somewhat lower than reported in prior studies (e.g., Mokros et al., 2017), which might be due to the fact that data were extracted from evaluation reports only without any additional assessment interview, but may also point to the need for better PCL-R rater training. As mentioned above, official registers may only show a limited section of the true rate of crime (e.g., Brunton-Smith et al., 2024). We were also not able to control potential treatment effects that may have influenced each individual's risk of aggression and violent crime. Eventually, we relied on a cumulative ACE score, although previous research on deviant behavior highlighted the benefit of examining person-centered ACE patterns (e.g., Barra et al., 2018), which was, however, beyond the scope of the present study.

Despite these limitations, our findings underscore the heterogeneity within the forensic population with regard to BPD and antisocial traits, their precursors in terms of ACEs, and their aftereffects related to aggression and violent crime. The current study contributed to a more sophisticated understanding of the dynamics among these constructs, inspiring further research as well as prevention and treatment approaches. Not only should justice-involved populations be routinely assessed for personality disturbances such as BPD and antisocial traits, but also for ACEs and tendencies of aggressive behavior. This may allow to assign them to specific treatment approaches that address their individual needs in order to reduce their risk of aggression and violent behavior (see also Risk-Need-Responsivity Model by Bonta and Andrews, 2007). Not only may approaches be promising that have been evolved from programs designed for BPD patients, such as Dialectical Behavioral Therapy for Forensic settings (DBT-F; Oermann, 2017), but also interventions that focus on ACEs and other traumatic experiences, like Narrative Exposure Therapy for Forensic Offender Rehabilitation (FORNET; Elbert et al., 2012). Eventually, children's and adolescents' risk of exposure to ACEs should be reduced in the first place to avoid maladaptive developments, for instance by the implementation of evidence-based prevention programmes (Jones Harden et al., 2020).

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CRediT authorship contribution statement

Steffen Barra: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Daniel Fittipaldi:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Petra Retz-Junginger:** Writing – review & editing, Resources. **Johannes Merscher:** Writing – review & editing. **Daniel Turner:** Writing – review & editing. **Wolfgang Retz:** Writing – review & editing, Resources, Project administration.

Declaration of competing interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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