



Childhood and parental characteristics of adults with DSM-5 intermittent explosive disorder compared with healthy and psychiatric controls

Saba Shevidi, Matthew A. Timmins, Emil F. Coccaro^{*}

Department of Psychiatry & Behavioral Health, The Ohio State University Wexner Medical Center, 430 Medical Center Drive, Columbus, OH 43210, United States of America

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ABSTRACT

Background: Intermittent Explosive Disorder (IED) is a disorder primarily of aggression, defined by recurrent behavioral outbursts out of proportion to provocations or stressors. IED first appears in childhood and adolescence. This study examines the underlying childhood environment of those with IED, particularly familial and school-related factors.

Methods: Adult participants from a larger study completed diagnostic assessments and a battery of self-report measures. Group assignment was based on the assessment: 1) IED diagnosis; 2) non-IED psychiatric diagnosis; and 3) no significant psychiatric history. Groups were compared on factors of parental demographics, intra-familial aggression, lifetime syndromal and personality diagnoses, neurodevelopmental and learning difficulties, childhood peer relationships, and juvenile legal issues.

Results: Significant patterns emerged specific to IED for not being raised by both parents, greater physical aggression to participant, and greater degree of fighting with peers by age ten.

Limitations: The retrospective, and cross-sectional, nature of the study, which prevent the making of causal inferences, and the basic nature of the questions asked of participants which limit a more nuanced interpretation of the data. A further limitation is bias associated with self-reported responses.

Conclusions: Results suggest the prevalence childhood adversities may be linked with IED; the childhood environment of those with IED likely is substantially more tumultuous than individuals with or without other psychiatric disorders.

1. Introduction

Intermittent Explosive Disorder (IED) is a disorder primarily of human aggression, defined by recurrent behavioral outbursts out of proportion to aggravating provocations or stressors. Aggression is a behavior that conveys human anger; however, in IED, this anger is out of proportion to the provocation and is not explained by another psychiatric condition. The DSM-5 [1] criteria of IED includes 1) frequent minor outbursts such as verbal tirades or minor physical aggression (at least twice a week on average, over three or more months [Criterion A1] or 2) infrequent major outbursts that result in physical harm to other or property (minimum of three major outbursts in a single year) [Criterion A2], all of which are not better explained by a different medical or mental disorder.

The lifetime prevalence of IED in the US is approximately 4% lifetime [2] and individuals with IED have a poorer quality of life and greater

psychosocial impairment compared with others without IED [3,4]. In addition, individuals with IED are more likely to have adverse health outcomes, including hypertension, coronary heart disease, and stroke [5]. The course of IED is waxing and waning, typically becoming obvious in childhood/adolescence and extending through adult life [6].

The prevalence of IED in adolescents is about twice that in adults, at nearly 8%, and IED has a mean age of onset at about 11 years of age [7]. Given this, it is likely that a variety of conditions and adverse events in childhood influence the development of IED. Such conditions and events would include household and parental characteristics as well as a history of experiencing and witnessing violent behavior during childhood. Specifically, childhood abuse has been associated with more aggressive personality traits including impulsivity and aggression [8], both of which are definitionally associated with IED. Additionally, physical abuse during childhood has been shown to be independently associated with IED, and both this physical abuse in addition to emotional abuse in

^{*} Corresponding author.

E-mail address: emil.coccaro@osumc.edu (E.F. Coccaro).

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childhood has been shown to independently predict aggression [9].

In addition to environmental factors, concrete neurobiological changes associated with childhood trauma have been shown to contribute to the development of aggression. For example, chronic hypothalamic-pituitary-adrenal axis activation from childhood stresses can result in the accelerated loss of hippocampal neurons, lags in myelination development, neurogenesis inhibition, and changes synaptic pruning [10]. Additionally, studies have shown that maltreated children have smaller intracranial and cerebral volumes, smaller mid-sagittal areas, and smaller middle/posterior corpus callosum regions [11]. Genetic susceptibility also plays a role in the development of aggressive personality traits. Monoamine oxidase A (MAO-A) is an enzyme involved in the deamination of dopamine, serotonin, and norepinephrine; MAO-A genetic deficiencies are linked with higher rates of aggression. Moreover, children with low MAO-A activity are more likely to develop antisocial behaviors [12].

Histories of environmental conflict in childhood may lead to learned aggressive behavior. Early physical abuse biases social information processing: individuals experiencing such early abuse are more likely to perceive benign acts as hostile with disinhibition of emotional and behavioral regulation [13]. Data from the NCS-R study revealed IED was associated with exposure to childhood trauma at a rate of 51.3% [14]. Furthermore, previous studies have shown that parental bonding is lowest among participants with IED, even compared to other psychiatric comorbidities [15].

To further explore conditions and childhood adversities of those with IED, this study focused on specific psychosocial aspects of IED participant households and childhoods. We specifically investigate the parent marital status, participant adoption status, intrafamilial physical aggression witnessed and experienced, frequency of contact with non-primary caregiver (in cases of parental separation), syndromal and personality psychopathology, neurodevelopmental and learning difficulties, behavioral issues at school, peer relationships, and juvenile legal concerns of participants with IED. We then compared these factors between participants with IED, those with a non-IED psychiatric diagnosis, and those without significant psychopathology.

2. Method

2.1. Participants

Eleven-hundred-forty-five ($n = 1145$) adult individuals participated in this study. All participants were physically healthy and were systematically evaluated regarding aggressive and other behaviors as part of a larger program designed to study correlates of impulsive aggressive, and other personality-related, behaviors in human participants. Participants were recruited through public service announcements, and newspaper advertisements seeking out individuals who: (a) reported psychosocial difficulty related to anger or, (b) had little evidence of psychopathology. All participants signed the informed consent document approved by the Institutional Review Board (IRB) of the Biological Sciences Division of the University of Chicago (IRB Protocol#: 10375; Approval Date: June 3, 2002).

2.2. Assignment of diagnoses

Psychiatric diagnoses were made according to DSM-5 criteria [1] using information from: (a) the Structured Clinical Interview for DSM Diagnoses (SCID-I) [16] for syndromal (formally Axis I) disorders and the Structured Interview for the Diagnosis of Personality Disorder [17] for personality (formally Axis II) disorders; (b) clinical interview by a research psychiatrist; and (c) review of all other available clinical data. Research diagnostic interviews were conducted by individuals with a masters, or doctorate, degree in Clinical Psychology. Inter-rater reliabilities across disorders were good to excellent (mean kappa of 0.84 ± 0.05 ; range: 0.79 to 0.93). Final diagnoses were assigned by team best-

estimate consensus procedures involving research psychiatrists and clinical psychologists [18]. Finally, participants with life history of bipolar disorder, schizophrenia (or other psychotic disorder), current substance abuse, or intellectual disability, were excluded from study.

After diagnostic assignment, 425 participants had no evidence of any psychiatric diagnosis (Healthy Controls: HC); 215 participants met criteria for a lifetime diagnosis of a Syndromal Psychiatric Disorder or Personality Disorder (Psychiatric Controls: PC), and 478 participants met criteria for a DSM-5 diagnosis of intermittent explosive disorder. Of the 693 PC/IED participants, most (81.7%) reported: a) history of formal psychiatric evaluation and/or treatment (64.5%) or, b) history of behavioral disturbance during which the participant, or others, thought they should have sought mental health services but did not (17.2%). Syndromal and Personality Disorder diagnoses are listed in Table 1.

2.3. Assessment of parental/home characteristics and neuro-behavioral/learning/behavioral issues of participants during childhood/adolescence

Prior to the SCID/SIDP interview, assessors completed a structured interview including questions about the home environment and about childhood/adolescent history of neurobehavioral, learning, and behavioral issues. The questions asked are discussed below.

2.3.1. Parental characteristics

This section included questions as to whether: a) participant was adopted or not (Yes/No), b) parents were ever married (Yes/No), c) parents stayed together or not (stayed together/separated or divorced), d) age of participant when parented separated or divorced, e) both parents raised participant throughout most of childhood and, if not, who raised the participant, f) if parents separated/divorced, how often did participant see mother and father (daily to weekly/less than weekly), g) participant lost anyone of significance through death and whether this occurred before the participant was 15 years of age (Yes/No), h) parent's occupation and highest level of education to determine socio-economic status by method of Hollingshead, h) parents hit participant during childhood/adolescence (hitting leading to bruising/hospital treatment, etc. vs. no/only physical punishment), i) parents hit participant's sibling(s) during childhood/adolescence (hitting leading to bruising, hospital treatment, etc. vs. no/only physical punishment).

2.3.2. Neuro-behavioral and learning issues during childhood/adolescence

This section included questions as to whether participant had: a) history of sleepwalking before age of 15 (Yes/No), b) history of stuttering/stammering before age of 15 (Yes/No), c) history of enuresis after age of 10 (Yes/No), d) history of difficulty with learning in school (Yes/No), e) being held back in grade (Yes/No).

2.3.3. Behavioral issues during childhood/adolescence

This section included questions as to whether participant had a history of behavioral problems in school: a) that led to suspensions or expulsions from school (Yes/No), b) history of getting into a lot of fights before the age of 10 (Yes/No), c) history of being rejected by peers before age of 10, d) history of arrest before the age of 15 (Yes/No).

2.4. Assessment of aggression, impulsivity, and related behaviors

Psychometric assessment of aggression, impulsivity, and related behaviors for participants included the Life History of Aggression (LHA; [19] and Buss-Perry Aggression Questionnaire (BPAQ) [20] for aggression; Life History of Impulsive Behavior (LHIB) [21] and Barratt Impulsiveness Scale (BIS-11) [22] for impulsivity; and the Beck Depression Inventory (BDI-2) [23] and Beck Anxiety Inventory (BAI) [24] for state depression and state anxiety, respectively.

Table 1
Demographic, functional, and psychometric characteristics of participants.

	Healthy controls (n = 452)	Psychiatric controls (n = 215)	Intermittent explosive disorder (n = 478)	p	Group differences
Demographics					
Age*	33.0 ± 11.5	33.1 ± 10.4	35.9 ± 10.9	< 0.001 ^a	HC = PC < IED
Gender (% Male)	45.40%	44.70%	43.70%	= 0.882 ^b	HC = PC = IED
Race (% White)	61.50%	54.90%	40.00%	< 0.001 ^b	HC = PC > IED
SES Score*	47.0 ± 11.0	42.3 ± 14.0	38.9 ± 13.0	< 0.001 ^a	HC > PC > IED
Psychosocial Function					
GAF Score*	82.5 ± 4.8	60.2 ± 8.3	54.9 ± 7.9	< 0.001 ^a	HC > PC > IED
Q-LES-Q Score*	49.5 ± 6.5	41.4 ± 9.7	36.4 ± 9.7	< 0.001 ^a	HC > PC > IED
Psychometric Variables					
Aggression: LHA	4.7 ± 3.4	8.3 ± 9.4	17.8 ± 4.4	< 0.001	HC < PC < IED
Aggression: BPA	27.4 ± 8.0	31.4 ± 9.6	45.6 ± 11.7	< 0.001	HC < PC < IED
Impulsivity: LHIB	29.1 ± 17.8	43.5 ± 17.9	54.4 ± 18.3	< 0.001	HC < PC < IED
Impulsivity: BIS-11	56.2 ± 9.1	65.6 ± 11.6	69.4 ± 11.7	< 0.001	HC < PC < IED
State Depression	3.0 ± 7.1	12.2 ± 11.6	16.7 ± 12.5	< 0.001	HC < PC < IED
State Anxiety	2.4 ± 3.6	7.6 ± 8.3	9.6 ± 8.7	< 0.001	HC < PC < IED

Note. Means ± SD based on raw data; statistics based on one-way ANCOVA (age, sex, ethnicity, and SES score as covariates).

* Mean ± Standard Deviation.

2.5. Statistical analysis

Comparisons of between-group variables were performed by Chi-square, analysis of variance/covariance (ANCOVA; MANCOVA). Other analyses involved binary logistic regression with relevant covariates as necessary. A two-tailed alpha value of 0.05 was used to denote statistical significance for all analyses.

3. Results

3.1. Sample characteristics

The groups did not differ in adoption status with only 2.3% to 2.7% of all participants, across the groups, reporting that they had been adopted (similar to the proportion in the general U.S. population: “Research: Adoption Facts.” Evan B. Donaldson Adoption Institute. 2013. Accessed: September 17, 2013). IED participants were modestly older than HC or PC participants, less likely to be white, and had a lower mean socioeconomic score than both HC and PC (PC < HC), but were similar in distribution in biological sex (Table 1). IED participants had the lowest scores for GAF and Q-LES-Q; PC participant scores for both were lower than those for HC participants (Table 1). As expected, IED participants had the highest scores on the aggression, impulsivity, and state depression/anxiety scores followed by PC, then HC participants (Table 1). Finally, IED and PC participants only differed in life history of a Substance Use Disorder, Conduct Disorder, and Oppositional Defiant Disorder (IED > PC) after correction for multiple comparisons (Table 2).

3.2. Socio-economic status of parents during childhood/adolescence (Table 1)

Self-reported SES scores of parents were lowest among IED participants (36.8 ± 13.0), compared to HC (41.5 ± 12.3) or PC (40.8 ± 13.4) participants, which also differed from each other (F[21018] = 15.51, $p < 0.001$) such that PC participants' self-reported parental SES scores were lower than HC participants'. SES scores of parents correlated with those of the adult participants to a moderate degree ($r = 0.36$, $p < 0.001$); these correlations did not differ by participant group.

3.3. Marital status of parents (Table 3)

IED participants did not differ significantly from the two control groups in the proportion of parents who were formally married, though IED study participants were significantly less likely to be raised by both parents than either PC or HC participants. IED participants were more

likely to report that their parents had been separated or divorced than HC participants but did not differ from PC participants on this item; the age at such separation did not differ among the groups.

3.4. Parental aggression towards each other (Table 4)

IED participants were more likely to report that their parents “frequently/often” hit each other during their childhood/adolescence compared with PC or HC participants. Fathers were more likely to hit mothers for both IED and PC participants, who did not differ from each other on this item; this was also true for mothers hitting fathers.

3.5. Parental aggression towards proband and siblings (Table 4)

IED participants were more likely to report that their parents “frequently/often” beat them during childhood/adolescence compared with PC or HC participants. The level of aggression from parents towards siblings, however, was similar between IED and PC participants, which was significantly more likely compared with HC participants.

3.6. Relationship with neuro-behavioral and learning difficulty issues (Table 5)

IED participants were more likely to report history of sleepwalking or stuttering before age of 15, or enuresis after the age of 5, compared with HC participants. PC participants reported a greater history enuresis compared with IED participants but only at a trend level of statistical significance. IED and PC participants also reported a greater history of learning difficulty in school compared with HC participants. Despite this, the three groups did not significantly differ in being held back in grade.

3.7. Relationship with behavioral issues in school (Table 6)

IED participants were more likely to report history of “fighting with peers” before age of 10, as well as “arrest by police” during adolescence, compared with PC and HC participants. Despite this, IED participants did not differ from PC participants in reporting “rejection by peers” before the age of 10; both groups were significantly different on this item compared with HC participants.

Table 2
Psychiatric diagnoses among participants.

	Psychiatric controls (n = 215)	Intermittent explosive disorder (n = 478)	p	Group differences*
Current Disorders:				
Any Depressive Disorder	46 (21.4%)	114 (23.8%)	=	PC = IED
			0.478	
Any Anxiety Disorder	83 (38.6%)	142 (29.7%)	=	PC = IED
			0.023	
Any Stress and Trauma Disorder	28 (13.0%)	87 (18.2%)	=	PC = IED
			0.090	
Any Obsessive-Compulsive Disorder	8 (3.7%)	21 (4.4%)	=	PC = IED
			0.683	
Any Eating Disorder	11 (5.1%)	33 (6.9%)	=	PC = IED
			0.372	
Any Non-IED Impulse Control Disorder	0 (0.0%)	12 (2.5%)	=	PC = IED
			0.019	
Conduct Disorder	4 (1.9%)	27 (5.7%)	=	PC = IED
			0.025	
Oppositional Defiant Disorder	1 (0.5%)	11 (2.3%)	=	PC = IED
			0.085	
Attention Deficit Hyperactivity Disorder	6 (2.8%)	37 (7.8%)	=	PC = IED
			0.012	
Lifetime Disorders:				
Any Depressive Disorder	126 (58.6%)	325 (68.0%)	=	PC = IED
			0.016	
Any Anxiety Disorder	99 (46.0%)	182 (38.1%)	=	PC = IED
			0.048	
Any Substance Use Disorder	57 (26.5%)	206 (43.1%)	<	PC < IED*
			0.001	
Any Stress and Trauma Disorder	40 (16.7%)	134 (26.6%)	=	PC = IED
			0.003	
Any Obsessive-Compulsive Disorder	15 (7.0%)	30 (6.3%)	=	PC = IED
			0.729	
Any Eating Disorder	32 (14.9%)	66 (13.8%)	=	PC = IED
			0.707	
Any Non-IED Impulse Control Disorder	5 (2.3%)	28 (5.9%)	=	PC = IED
			0.043	
Conduct Disorder	15 (6.9%)	131 (27.5%)	<	PC < IED*
			0.001	
Oppositional Defiant Disorder	10 (4.6%)	75 (15.7%)	<	PC < IED*
			0.001	
Attention Deficit Hyperactivity Disorder	17 (7.9%)	73 (15.3%)	<	PC = IED
			0.007	

* $p < 0.05$ after correction for multiple comparisons (uncorrected $p < 0.003$).

3.8. Effect of lifetime substance use disorder (SUD), conduct disorder (CD), and oppositional defiant disorder (ODD) on findings (Supplemental Tables)

Because PC and IED study participants differed significantly in the lifetime prevalence of SUD, CD, and ODD (IED > PC), and each is associated with increased aggression, we added these three disorders to the statistical models for the four variables with elevated and statistically significant adjusted odds ratios for IED vs. PC. IED continued to have elevated and statistically significant adjusted odds ratios for these variables in all participants, but not when only IED and PC participants were examined. In the former comparison the adjusted odds ratio for both IED and CD, but not for SUD or ODD, were significantly elevated. In the latter comparison, adjusted odds ratio for IED was not significantly elevated for "Arrest by Police" though it was for CD.

Table 3
Parental variables among participants.

	HC (n = 452)	PC (n = 215)	IED (n = 478)	Adjusted OR IED vs ALL	Adjusted OR IED vs PC
Both Biological Parents					
Married to Each Other	410 (90.7%)	190 (88.4%)	387 (81.0%)	0.69 (0.47–1.01) ($p = 0.057$)	0.65 (0.39–1.10) ($p = 0.106$)
Raised by Both Parents	361 (79.9%)	158 (73.5%)	277 (57.9%)	0.52 (0.39–0.69) ($p < 0.001$)	0.54 (0.37–0.79) ($p = 0.002$)
Raised by One Biological Parent					
Parental Separation	135 (29.9%)	92 (42.8%)	250 (52.3%)	1.64 (1.26–2.13) ($p < 0.001$)	1.30 (0.92–1.83) ($p = 0.140$)
Age at Separation (\pm SD)	9.6 \pm 6.5	10.6 \pm 6.1	9.2 \pm 6.9	N/A	N/A
Frequent Contact - Mother	125 (92.6%)	83 (90.2%)	215 (86.0%)	0.43 (0.24–0.75) ($p = 0.003$)	0.58 (0.28–1.19) ($p = 0.134$)
Frequent Contact - Father	57 (42.2%)	36 (39.1%)	32 (32.4%)	0.60 (0.45–0.80) ($p < 0.001$)	0.69 (0.47–0.99) ($p = 0.050$)

Note. HC = Healthy Controls; PC = Psychiatric Controls; IED = Intermittent Explosive Disorder.

Table 4
Aggression in household during childhood/adolescence.

	HC (n = 452)	PC (n = 215)	IED (n = 478)	Adjusted OR IED vs ALL	Adjusted OR IED vs PC
Intimate Partner Violence					
Parents Hit Each Other	8 (1.8%)	21 (9.8%)	73 (15.3%)	2.95 (1.85–4.71) ($p < 0.001$)	1.45 (0.85–2.47) ($p = 0.174$)
Father Hits Mother	7 (1.5%)	17 (7.9%)	64 (13.4%)	3.11 (1.88–5.16) ($p < 0.001$)	1.54 (0.86–2.75) ($p = 0.146$)
Mother Hits Father	2 (0.4%)	7 (3.3%)	28 (5.9%)	3.48 (1.58–7.65) ($p = 0.002$)	1.60 (0.68–3.82) ($p = 0.285$)
Parents Hits/Beats Severely					
Participant	47 (10.6%)	54 (25.8%)	207 (45.3%)	3.56 (2.68–4.73) ($p < 0.001$)	1.97 (1.37–2.84) ($p < 0.001$)
Participant's Siblings	45 (10.1%)	53 (25.4%)	161 (35.2%)	2.40 (1.79–3.22) ($p < 0.001$)	1.28 (0.88–1.85) ($p = 0.199$)

Note. Aggression in household during childhood/adolescence was determined when the participant indicated the behavior occurred "often/frequently." HC = Healthy Controls; PC = Psychiatric Controls; IED = Intermittent Explosive Disorder.

4. Discussion

Analysis of these data reveals significant differences in several areas including parental SES, the identity of the individual who raised the study participant, parental aggression towards the participant, and

Table 5
Neuro-behavioral and learning issues in childhood/adolescence.

	HC (<i>n</i> = 452)	PC (<i>n</i> = 215)	IED (<i>n</i> = 478)	Adjusted OR IED vs ALL	Adjusted OR IED vs PC
History of Sleepwalking (Before Age 15)	37 (8.2%)	22 (10.2%)	62 (13.0%)	1.67 (1.12–2.49) (<i>p</i> = 0.016)	1.46 (0.86–2.48) (<i>p</i> = 0.161)
History of Stuttering (Before Age 15)	22 (4.9%)	25 (11.6%)	49 (10.3%)	1.25 (0.81–1.94) (<i>p</i> = 0.318)	0.77 (0.46–1.31) (<i>p</i> = 0.337)
History of Enuresis (After Age 5)	33 (7.3%)	48 (22.3%)	87 (18.2%)	1.35 (0.98–1.91) (<i>p</i> < 0.087)	0.68 (0.45–1.02) (<i>p</i> = 0.062)
Learning Difficulties	23 (5.1%)	42 (19.5%)	111 (23.2%)	2.42 (1.71–3.43) (<i>p</i> < 0.001)	1.18 (0.78–1.78) (<i>p</i> = 0.424)
Held Back in Grade	20 (4.4%)	18 (8.4%)	52 (10.9%)	1.36 (0.86–2.17) (<i>p</i> = 0.190)	1.10 (0.61–1.99) (<i>p</i> = 0.740)

Note. HC = Healthy Controls; PC = Psychiatric Controls; IED = Intermittent Explosive Disorder.

Table 6
Behavioral issues in childhood and adolescence.

	HC (<i>n</i> = 452)	PC (<i>n</i> = 215)	IED (<i>n</i> = 478)	Adjusted OR IED vs ALL	Adjusted OR IED vs PC
Rejection by Peers (Before Age 10)	21 (4.6%)	78 (36.3%)	198 (41.4%)	3.85 (2.87–5.16) (<i>p</i> < 0.001)	1.28 (0.91–1.81) (<i>p</i> = 0.151)
Fighting with Peers (Before Age 10)	10 (2.2%)	21 (9.8%)	127 (26.6%)	6.45 (4.21–9.89) (<i>p</i> < 0.001)	3.09 (1.87–5.11) (<i>p</i> < 0.001)
Arrest by Police (Before Age 18)	12 (2.7%)	20 (9.3%)	101 (21.1%)	4.63 (2.99–7.15) (<i>p</i> < 0.001)	2.51 (1.49–4.25) (<i>p</i> < 0.001)

Note. HC = Healthy Controls; PC = Psychiatric Controls; IED = Intermittent Explosive Disorder.

childhood history of fighting with peers in study participants with IED compared with both healthy controls and psychiatric controls. Overall, these results suggest that the presence of childhood adversity is linked with the presence of IED and that the childhood environment of those with IED is substantially more tumultuous compared to both healthy individuals and individuals with non-aggressive psychiatric disorders.

The combination of lower parental SES and greater intrafamilial violence in participants with IED can be used to infer important details about their childhood environment. For one, lower SES suggests that participants were more likely to grow up in a financially insecure household, leading to uncertainty and stressors that can facilitate aggressive behavior (e.g., family dysregulation, parental depression; 25). In turn, these stressors may partially account for why the parents of such individuals behave more aggressively on a regular basis. This notion of frequent intrafamilial violence is consistent with research that suggests those with IED are more likely to have immediate family members with IED [26]. This learned pattern of aggressive behavior, in part, translates to environments outside the household (such as at school) as participants with IED reported they were more likely to fight with their peers, peer rejection, and/or juvenile arrest records compared to participants without a psychiatric diagnosis.

That said, aggressive behavior is also under genetic influence as well as the influence of injury that can result when engaging in aggressive behavior (e.g., traumatic brain injury). Twin studies clearly report substantial genetic influence underlying aggressive [27,28] and impulsive [29] behaviors while case-control studies report increased aggressive behavior among those with traumatic head injury even if it is of mild severity [30]. Thus, there may be no less than three routes to aggressive behavior: through behaviors that are inherited, behaviors that are learned, and that may be a consequence of being aggressive.

Another notable finding is that IED participants were more likely to be raised by a single parent. When combined with the previously described risk factors (e.g., lower SES, intrafamilial violence, peer rejection), it can be inferred that IED participants also lacked protective factors in childhood. For example, within single-parent, lower SES households, the parent is more likely to have a full-time job and less time to spend with their children during the day. Thus, IED participants may have received less supportive quality time with their parent, and their parent may have had less time and resources to identify and address behavioral issues during the participant's childhood compared to healthy control participants [25,31]. Further, compared with healthy study participants, study participants with IED were less likely to have frequent contact with their parent who was not the primary caregiver, compounding the potential lack of parental support. Although differences in parental separation, contact with the non-primary caregiving parent, sleepwalking, and learning difficulties were found between IED and healthy participants, such differences were not found between IED and participants with non-aggressive psychopathology. Thus, these factors were more likely associated with psychopathology in general rather than with aggressive behavior.

While study participants with IED differed in many respects from study participants with non-aggressive psychopathology, the two groups did not differ on variables related to peer rejection and to poor academic function. Given the fact that study participants with IED reported greater incidence of fighting with peers, the similarity in report of peer rejection was surprising. However, there are several paths to peer rejection besides aggressive behavior. Similarly, poor academic function is not specifically related to aggressive behavior even though it can contribute to limited academic achievement.

This study has both strengths and weaknesses. Among its strengths include the relatively large sample and the systematic evaluation of its study participants in terms of diagnoses and behavioral assessments. Among its weaknesses, include the retrospective nature of the study, which makes it subject to recall bias; the cross-sectional nature of the study, which prevents the making of causal inferences; the relatively simple, though fundamental, questions posed to the study participants, which prevent more nuanced interpretation of the data; and the fact that individuals with some disorders, such as bipolar disorder and active substance use disorder, were not included in this study. Future research may seek to include those with the excluded psychopathologies and make similar comparisons to examine whether childhood environments are associated with IED above and beyond other diagnoses with elevated rates of aggression.

5. Conclusion

The disproportionately aggressive nature of IED lends little surprise to the idea that individuals with IED have had (and/or report) conflict-ridden childhoods. These results suggest that interventions that more strongly support higher-need families may be warranted to reduce the

development of IED and its behaviors.

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Funding sources has no role in study design or in the collection, analysis and interpretation of data or in the writing of this report.

Declaration of Competing Interest

Dr. Coccaro reports being a member and consultant to the Scientific Advisory Boards of Azevan Pharmaceuticals, Inc., Avanir Pharmaceuticals, Inc., and Boehringer Ingelheim Pharmaceuticals, Inc. Drs. Shevidi and Timmins have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.comppsy.2023.152367>.

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