Intermittent explosive disorder-integrated research diagnostic criteria: Convergent and discriminant validity

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Abstract

Research on intermittent explosive disorder (IED) has been hindered by vague and restrictive DSM-IV diagnostic criteria. Integrated research criteria have been developed for IED (IED-IR) that address the DSM-IV criteria's shortcomings. The purpose of this study was to examine the convergent and discriminant validity of the IED-IR criteria set by comparing adults meeting these criteria ($n = 56$) to healthy controls ($n = 56$) and to individuals with an Axis I major mental disorder ($n = 33$) or an Axis II personality disorder ($n = 22$) diagnoses on measures of aggression (self-report and behavioral) and global functioning. IED-IR individuals demonstrated higher levels of aggression compared to the other three groups, and were rated as more impaired than the healthy control and Axis I individuals. Subgroup analyses showed that IED-IR subjects who did not meet DSM IED criteria did not differ from DSM IED subjects on self-report measures of aggressiveness or global functioning. Furthermore, the IED-IR subjects evidenced more behavioral aggression than their DSM-IED counterparts.
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1. Introduction

Aggression, defined as verbal or physical acts intended to cause emotional, psychological, or physical harm, is a major public health concern. Approximately 77 million adults have engaged in at least one serious act of physical aggression (Robbins and Reiger, 1991), and these numbers do not include acts of serious verbal aggression (e.g., screaming, threatening and cursing), which are even more ubiquitous (Newton et al., 2001). In the US alone, aggression costs hundreds of billions of dollars in annual healthcare expenditures, law enforcement expenses, and lost workplace productivity (US Department of Health and Human Services, 2000). The human costs of aggression are also substantial and include the intergenerational transmission of aggression from caregiver to child (Conger et al., 2003). The scope of aggression is sufficiently vast for the World Health Organization to proclaim violence as a leading worldwide public health problem (Krug et al., 2002).

Most definitions of aggression reflect the notion that aggression is multi-determined and can be expressed along a continuum of severity, from minor verbal assaults (yelling and cursing) to lethal physical aggression (Solari and Baldwin, 2002). Although aggressive acts across the spectrum of severity are quite common, the consensus of most clinicians and theorists is that some forms of aggression reflect psychopathology, whereas

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others merely constitute uncivil behavior (Stone, 1995). Furthermore, in some contexts, even severe acts of aggression are considered normal and adaptive (e.g., fighting back when physically attacked). Specific acts of aggression may be situational, but the tendency to behave aggressively represents a trait that begins early in life and continues through adulthood (Olweus, 1979). Identifying behavior sets that reflect psychopathological aggression has been a significant challenge to the field (Coccaro, 2003). However, the existence of valid formal diagnostic criteria sets to categorize pathological aggression would be of great benefit for both epidemiological and treatment research (Coccaro and Kavoussi, 1997; Coccaro et al., 1998). In fact, diagnostic heterogeneity across subjects has been cited as one reason that effect sizes for anger/aggression treatments are smaller than those for depressive and anxiety disorders (DiGiuseppe and Tafrate, 2003).

Intermittent explosive disorder (IED) is the sole Diagnostic and Statistical Manual-4th Edition (DSM-IV-TR; American Psychiatric Association, 2000) psychiatric diagnostic category for which recurrent acts of aggression are a cardinal symptom (Table 1). Unfortunately, there are several significant limitations and ambiguities to this diagnostic entity. For example, DSM-IV IED sets no minimum requirement for how frequently the aggressive behaviors must occur, the time period demarketing the occurrence of these behaviors, or the severity of the behaviors that can be included (Coccaro, 2003). Likewise, despite the label ''Intermittent Explosive Disorder,'' the DSM-IV does not explicitly require that the aggressive behavior be ''impulsive'' or ''explosive'' in nature. Volitional, well-planned, and goal-directed violence arguably reflects social deviance, sociopathy, or criminal behavior rather than pathological impulsive aggression, and thus individuals who exhibit predominately non-impulsive forms of aggression should not be ''captured'' by the criteria set.

DSM-IV IED does not require distress or functional impairment resulting from aggressive acts to be present. Equally troubling, the distinction between aggressive acts that are or are not ''better accounted for'' by other forms of personality psychopathology (i.e., Borderline or Antisocial Personality Disorder) is virtually impossible to determine. Finally, the DSM-IV's inclusion of only serious acts of violence directed toward people and property does not capture all forms of physical and verbal aggression that may be pathological.

Research has shown that individuals who engage in frequent verbal aggression and less severe physical aggression show levels of subjective distress and functional impairment equivalent to of individuals with DSM-IV IED (Coccaro, 2003). By excluding individuals who manifest less severe, but more frequent acts of aggression, the DSM-IV excludes a population clearly affected by their aggressive behavior. Consequently, DSM-IV IED may underestimate the proportion of individuals with pathological levels of aggression.

To address these shortcomings, Coccaro et al. (1998) developed a Research Criteria set for IED (IED-R). These criteria expanded the realm of IED aggressive behaviors to include frequent acts of verbal aggression (e.g., screaming; threats) as well as less severe forms of physical aggression and property damage (Coccaro et al., 1998). IED-R also provided an objective criterion for aggression frequency (two or more aggressive outbursts a week on average for at least one month) and explicitly states that the aggressive behavior must be impulsive. Moreover, the troublesome exclusionary criterion ''not better accounted for by Borderline or Antisocial Personality Disorder'' is eliminated. The IED-R criteria also required evidence of distress or impairment. The validity of the IED-R diagnosis was supported by findings that IED-R individuals report more aggressive acts and have lower psychosocial functioning compared to individuals with personality disorders (Coccaro et al., 1998). However, the IED-R criteria were limited in that they excluded some participants that most resembled the DSM-IV IED criteria, namely those who exhibit more severe aggression, but at a relatively low frequency. Thus, a second aggression frequency criterion was added that allowed for the diagnosis if three acts of physical assault or destruction of property occurred over a 12-month period (Coccaro, 2003). The new criteria were termed IED Integrated Research criteria (IED-IR; see Table 2) because it integrated the aggression intensity and frequency from IED-R and the current DSM-IV IED criteria sets.

As stated, Coccaro et al. (1998) found evidence for the validity of the IED-R diagnosis. However, it could be argued that the finding of differences between clinical interview-derived diagnostic groups on similar self-report aggression measures is tautological, and that observable behavioral differences are needed to validate an IED-IR diagnosis. Furthermore, no published study has specifically examined the validity of the newer

Table 1
DSM-IV criteria for intermittent explosive disorder

A. Several discrete episodes of failure to resist aggressive impulses that result in serious assaultive acts or destruction of property
B. The degree of aggressiveness expressed during the episode is grossly out of proportion to any precipitating psychosocial stressors
C. The aggressive episodes are not better accounted for by another mental disorder (e.g., Antisocial Personality Disorder, Borderline Personality Disorder, Psychotic Disorder, a Manic Episode, Conduct Disorder, or Attention Deficit/Hyperactivity Disorder) and are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., head trauma or Alzheimer's disease)

Table 2
Integrated research criteria for intermittent explosive disorder

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A. Recurrent incidents of aggression manifest as either:
  A1. Verbal or physical aggression towards other people, animals, or property occurring twice weekly on average for one month, or
  A2. Three episodes involving physical assault against other people or destruction of property over one-year period
B. The degree of aggressiveness expressed is grossly out of proportion to the provocation or any precipitating psychosocial stressors
C. The aggressive behavior is generally not premeditated (e.g., is impulsive) and is not committed in order to achieve some tangible objective (e.g., money, power, intimidation, etc.)
D. The aggressive behavior causes either marked distress in the individual or impairment in occupational or interpersonal functioning
E. The aggressive behavior is not better accounted for by another mental disorder (e.g., Major Depressive/Manic/Psychotic Disorder; ADHD); General Medical Condition (e.g., Head Trauma, Senile Dementia Alzheimer's Type); or to the direct physiological effects of a substance

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IED-IR criteria set. Accordingly, the aim of the present study was examine the convergent and discriminant validity of the IED-IR diagnosis both using self-report and behavioral measures. To assess discriminant validity, IED-IR individuals were compared to Healthy Controls, Axis I Controls, and Personality Disordered Controls on self and clinician ratings of aggression, aggressive behavior observed under controlled laboratory conditions, and overall psychosocial functioning. To assess convergent validity, subjects meeting the broader category of IED-IR were compared to subjects who only met for the narrower DSM-IV IED criteria on the aforementioned self-report and behavioral measures. Based on the limited previous research on IED-R (e.g., Coccaro et al., 1998) it is predicted that IED-IR participants will evidence significantly higher levels of aggression (self-reported and behavioral) and lower psychosocial functioning compared to individuals without IED-IR. It is also predicted that the two subgroups of IED-IR individuals will not differ significantly on these measures.

2. Method

2.1. Participants

Participants were men and women recruited as a part of larger ongoing research protocols in the Clinical Neuroscience and Psychopharmacology Research Unit (CNPRU) at the University of Chicago from 2002 to 2004. Participants were recruited through print and radio advertisements for healthy volunteers and individuals with anger problems. Informed consent was obtained for all participants. Participants were excluded from all CNPRU studies if they reported: (a) current drug or alcohol dependence, (b) current psychopharmacotherapy, (c) a history of bipolar or psychotic disorder, or (d) a traumatic head injury with a loss of consciousness greater than 60 min. Exclusion criteria (a) and (b) are in place because individuals engaging in illicit drug use, excessive alcohol use, or current psychopharmacotherapy cannot participate in the neuroscience studies conducted at this site. This study was approved by the University of Chicago Internal Review Board.

For this study, participants were grouped on the following basis: (a) no history of Axis I or Axis II disorders (Healthy Control: HC), (b) a history of Axis I disorders without any lifetime IED or Axis II personality disorder (PD) diagnosis (Axis I Control: AIC), (c) an Axis II diagnosis without any history of IED (personality disorder control: PDC), or (d) a history of IED-IR (IED-IR). The 167 participants[1] completing the study [HC, $n = 56$; AIC, $n = 33$; PDC, $n = 22$; and IED-IR, $n = 56$] ranged in age from 18 to 65 years ($M = 34.21$, SD = 10.10), and were evenly distributed across genders (Men = 86; Women = 81). The sample consisted of participants who were predominately Caucasian (60%), or African-American (20%), and were relatively well-educated (79% had some college education).

2.2. Psychiatric diagnostic rating interviews

2.2.1. Structured clinical interview for the DSM-IV (SCID; First et al., 1996)

The SCID was used to diagnose DSM-IV Axis I disorders (excluding IED). The SCID is a semi-structured clinical interview used to assign diagnoses for mood disorders, schizophrenia and other psychotic disorders, alcohol and other substance abuse and dependence, anxiety disorders, somatoform disorders, eating disorders, and adjustment disorders. The SCID has adequate inter-rater reliability with kappa values for modules reported to be between 0.70 and 1.00 (First et al., 1996).

2.2.2. Structured interview for DSM-IV personality (SIDP; Pfohl et al., 1995)

The SIDP was employed to assess personality psychopathology, operationally defined as Axis II DSM IV personality disorders. Estimates of inter-rater reliability for the SIDP are reported to be adequate (Pfohl et al., 1995).

2.2.3. Global assessment of functioning (GAF; American Psychiatric Association, 2000)

The GAF is a 0–100 score that reflects the extent to which psychological problems have impaired social and occupational functioning. Lower scores reflect greater impairment.

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[1] Nine of the original 176 participants were excluded from the study because they reported believing the Taylor Aggression Paradigm (see Section 2) was studying aggression or that the opponent was not real.

2.2.4. Intermittent explosive disorder interview (IED interview; Coccaro, unpublished instrument)

The IED interview is a structured clinical interview used to assess and diagnose both DSM-IV IED and IED-IR. The IED interview obtains quantitative (e.g., frequency) and qualitative (e.g., description of most severe events) data for verbal aggression, aggression against property, and aggression against others, as well as the level of distress and impairment resulting from these behaviors. The IED interview also assesses exclusionary criteria by determining to what extent the aggressive acts occur during the presentation of other Axis I disorders (e.g., mood and substance use disorders), substance use, or a general medical condition. Preliminary data show the IED interview to be a valid and reliable instrument (Coccaro and McCloskey, 2004).

2.3. Self- and clinician-ratings of aggression

2.3.1. Buss–Perry aggression questionnaire (BPAQ; Buss and Perry, 1992)

The BPAQ is a self-report measure of trait aggressiveness. The BPAQ consists of 29 items each scored using a four point Likert-type scale. The BPAQ is comprised of four scales: physical aggressiveness, verbal aggressiveness, anger, and hostility (i.e., suspiciousness and resentment). The BPAQ has well-known psychometric properties (Buss and Perry, 1992).

2.3.2. Life history of aggression–aggression scale (LHA-AS; Coccaro et al., 1997)

The LHA is a retrospective semi-structured clinical interview of the frequency and severity of aggression, self-aggression, and antisocial behavior. For the present study, the aggression scale of the LHA was used. The LHA-AS contains five items related to life frequency of temper tantrums, general fighting, specific physical assault, specific property assault, and verbal assault. The LHA-AS has high internal consistency (alpha = 0.87), excellent inter-rater reliability (ICC = 0.95), and good test–retest reliability up to one year ($r = 0.80$).

2.4. Behavioral measure of aggression

2.4.1. Taylor aggression paradigm (TAP; Taylor, 1967)

The TAP is a classic laboratory measure of retaliatory aggressive behavior. In this task, the participant competes against a fictitious opponent in a reaction-time game during which electric shock is administered and received (for a more detailed description of the TAP, see McCloskey and Berman, 2003). Before each trial, the participant selects a shock level for the opponent to receive should the participant have a faster reaction-time on that trial. Aggression is defined as the intensity of shock selected. Retaliatory aggression is elicited by having the "opponent" select increasingly intense shock lev-

els for the participant to receive. A rich literature supports the validity of the inferences that can be drawn from the TAP and related laboratory measures of physical aggressive behavior (Anderson and Bushman, 1997; Giancola and Chermack, 1998), and the construct validity for the TAP has been repeatedly shown via correlations with self-report and interview measures of trait aggressiveness (e.g., Berman et al., 2002; Bernstein et al., 1987; Giancola and Zeichner, 1995). Furthermore, when participants are divided into groups based on aggression history, high aggression groups are shown to respond more aggressively on the TAP when unprovoked, and even more so when provoked (Bushman et al., 2001; Taylor, 1967).

2.5. Procedure

Participants completed the interview, self-report measures and behavioral task on separate days scheduled 1 to 4 weeks apart. On day 1, participants completed a 3–4 h diagnostic interview conducted by trained graduate-level diagnostic raters. IED-IR and DSM-IED were assessed using the IED interview, and other Axis I disorders were assessed using the SCID. Personality disorders were assessed using the SIDP. Diagnostic raters also assigned a GAF score based on the information obtained from the diagnostic interview. Frequency of aggressive acts was also assessed using the LHA. Participants then completed a booklet of paper-and-pencil measures that included the BPAQ. Other measures in the booklet were non-aggression measures and will be presented elsewhere. Diagnostic raters were unaware of the participant's responses on the self-report measures. To minimize potential bias on TAP responding associated with knowing the participant's diagnostic status, all TAP events were pre-programmed and computer controlled. Participants also completed a post task questionnaire to examine the integrity of the experimental manipulations.

All diagnoses and GAF scores were made according to DSM-IV (and IED-IR) criteria using a "best estimate procedure" in which both a written diagnostic report and the raw interview data were reviewed by a multidisciplinary committee of (at a minimum) six research professionals, including psychiatrists, psychologists, and other diagnosticians (Klein et al., 1994; Leckman et al., 1982.)

On day 2, participants completed a urine drug test and alcohol breathalyzer test. Participants failing either test were excluded from the study. Participants were then prepared for the TAP. Fingertip electrodes were attached to the index and middle fingers of the participant's non-dominant hand. The experimenter informed the participant that he or she would be competing in a task against another (fictitious) participant who was in a different room in the research suite. The experimenter

then excused him or herself "to prepare the other subject" for the experiment.

After a short delay, an upper shock pain threshold was determined by administering increasingly intense shocks at 100-μA intervals until the participant reported that the shock was "very unpleasant." To increase the credibility of the experimental situation, this procedure was repeated with the other "subject" (an audiotape of a confederate), and overheard by the participant. After the threshold determination, task instructions were provided via intercom to both "participants," indicating that the purpose of the task was to see which subject could lift a finger off a reaction-time key the fastest. Before each reaction time trial, each subject was to select a shock from *0* to *10* or *20* by pressing one of 12 buttons on the bottom of the console. The slower person on each trial would receive the shock chosen by his or her opponent before that trial. The *10* shock was equivalent to the shock level judged very unpleasant. The *9* shock was set at 95% of this maximum, *8* at 90%, *7* at 85%, and so forth. The participant was informed that the *20* shock would administer a "severe" shock, twice the intensity of the *10* (in actuality, in the one instance the fictitious opponent selects a *20*, the participant does not receive the shock because he or she "wins" the trial). Thus, a *20*-shock selected by the participant indicated extreme aggression towards the opponent. Participants were told that if they selected a *0*, no shock would be administered to their opponent on losing trials (a non-aggressive response option was included to increase the ecological validity of the task).

Participants next completed 28 reaction-time trials consisting of an initial trial, followed by four, 6-trial blocks of increasing provocation by the opponent. The average shock setting by the fictitious opponent across the first three blocks was 2.5, 5.5, and 8.5, respectively. The fourth block differs from the third block only in that a highly aversive "20" shock is ostensibly selected by the opponent on one trial. Blocks were separated by a trial of intermediate intensity to smooth the transition between blocks. The participant lost (received the opponent shock) on half the trials, with the frequency of wins and losses pre-programmed by the experimenter. After the TAP, the participant was debriefed to determine if he or she believed that the interaction was with another participant, and to ensure that the participant did not know that the true purpose of the task was to examine aggressive behavior.

3. Results

Analyses were conducted 2-tailed at the 0.05 level of significance. Significant within-subjects effects were tested using the Greenhouse–Geisser correction when violations of sphericity were detected. All uncorrected significant findings remained significant when thus adjusted. We therefore report the degrees of freedom from uncorrected analyses. Post hoc mean comparisons were performed using Tukey's honestly significant test ($p < 0.05$) for between group factors and Bonferroni corrected (0.05/# of contrasts) t-tests for within-subjects factors (Keppel, 1991). Significant interactions were probed using simple effects analyses as specified by Girden (1992). Effect sizes are provided using partial eta squared ($\acute{\eta}_p^2$) for analyses of variance and Cohen's d (d) for t-tests (Cohen, 1988). For $\acute{\eta}_p^2$ 0.01, 0.06, and 0.14 are considered small, medium, and large effect sizes. For d small, medium, and large effect sizes correspond to 0.20, 0.50, and 0.80, respectively (Cohen, 1988).

3.1. Inter-correlations among study variables

As Table 3 shows, self-report measures of anger and aggression (e.g., BPAQ, LHA-AS) were significantly correlated with aggressive responding on the TAP. The exception to this was the physical aggression scale of the BPAQ, which was correlated with the frequency of extreme aggression (20 shocks), but not with initial or average shock setting. Self-report anger and aggression

Table 3
Inter-correlations among study measures

Measure	BPAQ-VA	BPAQ-Ang	BPAQ-Hos	LHA-AS	GAF	Trial 1 Shock	Mean Shock	20 Shock
BPAQ-PA	0.78**	0.80**	0.62**	0.50**	−0.40**	0.10	0.11	0.21*
BPAQ-VA		0.86**	0.69**	0.58**	−0.47**	0.19*	0.25**	0.28**
BPAQ-Ang			0.79**	0.67**	−0.58**	0.19*	0.31**	0.31**
BPAQ-Hos				0.73**	−0.65**	0.34**	0.43**	0.34**
LHA-AS					−0.70**	0.37**	0.48**	0.38**
GAF						−0.35**	−0.44**	−0.32**
Trial 1 shock							0.73**	0.56**
Mean shock								0.56**

Note. BPAQ = Buss–Perry aggression questionnaire; PA = physical aggression scale; VA = verbal aggression scale; Ang = anger scale; Hos = hostility scale; LHA AS = Life history of aggression–aggression scale; GAF = global assessment of functioning; 20 Shock = number of 20 shocks administered.
* $p < 0.05$.
** $p < 0.01$.

Table 4
Demographic variables as a function of diagnostic group

Variable	Diagnostic group				
	HC	AIC	PDC	IED-IR	Total
Age (SD)	33.02 (9.96)	34.50 (9.92)	34.81 (11.38)	34.88 (10.37)	34.16 (10.12)
Gender (%)					
Male	30 (53.6)	14 (42.4)	11 (50.0)	31 (55.4)	86 (51.5)
Female	26 (46.4)	19 (57.6)	11 (50.0)	25 (44.6)	81 (48.5)
Race (%)					
Caucasian	35 (62.5)	24 (72.7)	13 (59.1)	32 (57.1)	104 (62.3)
AA/other	21 (37.5)	9 (27.3)	9 (14.3)	24 (42.9)	63 (37.7)
Education[a] (%)					
− College Grad	15 (29.4)	13 (46.4)	13 (61.9)	39 (72.2)	80 (51.9)
+ College Grad	36 (70.6)	15 (53.6)	8 (38.1)	15 (27.8)	74 (48.1)

[a] $N = 154$ as data from 13 participants was missing.

scales were all highly correlated with each other, as were the three behavioral aggression indices. All anger and aggression variables were negatively correlated with psychosocial functioning (i.e., GAF score).

3.2. Demographic variables

Preliminary analyses indicated that the four groups did not differ in age, $F(3, 163) < 1$, gender composition, $\chi^2(3, N = 167) = 1.54$, $p = 0.67$, or racial composition, $\chi^2(3, N = 167) = 2.26$, $p = 0.52$ (see Table 4 for demographic variable means and percentages). There was a significant difference in education level between groups, $\chi^2(3, N = 167) = 20.44$, $p < 0.001$. Follow up χ^2 analyses showed that IED-IR participants were significantly less likely to have graduated college than HC [$\chi^2(1, N = 112) = 19.24$, $p < 0.001$] or AIC [$\chi^2(1, N = 89) = 5.28$, $p < 0.05$] participants. PDC participants were also less likely to be a college graduate than HC participants, $\chi^2(1, N = 78) = 6.60$, $p < 0.05$.[2]

3.3. Axis I psychopathology by diagnostic group

By definition, the HC group had no Axis I or Axis II psychopathology. Axis I (non-IED) diagnoses across the remaining three groups are provided in Table 5. χ^2 analyses showed that there was a difference in proportion of participants with an Axis I diagnosis across groups, $\chi^2(2, N = 111) = 12.79$, $p < 0.005$. Post hoc χ^2 analyses revealed that PDC participants were less likely to have any Axis I diagnoses than participants in the AIC [$\chi^2(1, N = 55) = 10.71$, $p < 0.005$] or IED-IR [$\chi^2(1, N = 78) = 5.79$, $p < 0.05$] groups. The AIC and IED-IR groups did not differ from each other, $\chi^2(1, N = 89) = 2.27$, $p = 0.13$. A one-way ANOVA comparing the

Table 5
Axis I psychopathology across diagnostic groups

Axis I psychopathology	Diagnostic group			χ^2
	AIC	PDC	IED-IR	
Depressive disorders	16	6	29	3.94
Anxiety disorders	6	5	22	5.07
Substance use disorders	13	8	32	4.04
Other disorders	4	3	11	1.00
Any (non-IED) axis I disorder	33	14	49	12.22*

* $p < 0.05$.

number of (non-IED) Axis I diagnoses across the three groups was significant, $F(2,108) = 7.80$, $p < 0.001$. Post hoc mean comparisons indicated that the IED-IR group had more Axis I diagnoses ($M = 2.07$, $SD = 1.43$) than either the AIC ($M = 1.18$, $SD = 0.63$) or PDC ($M = 1.18$, $SD = 1.09$) groups.[3]

3.4. Axis II psychopathology by diagnostic group

By definition, the HC and AIC groups had no Axis II psychopathology. χ^2 analyses indicated that there were no significant difference in the proportion of PDC ($n = 22$; 100%) and IED-IR ($n = 46$; 82%) participants with a personality disorder, $\chi^2(1, N = 78) = 2.31$, $p = 0.13$. IED-IR participants were more likely to have a Cluster A ($n = 14$; 25%) personality disorder than the PDC participants ($n = 4$; 18%), $\chi^2(1, N = 78) = 4.26$, $p < 0.05$. Cluster B disorders were also more frequent in the IED-IR group ($n = 29$; 51%) as compared to the PDC group ($n = 4$; 18%), $\chi^2(1, N = 78) = 7.30$, $p < 0.01$. IED-IR participants were less likely to have a personality disorder NOS diagnosis ($n = 11$; 20%) than their PDC ($n = 11$; 50%) counterparts, $\chi^2(1, N = 78) = 7.18$, $p < 0.01$. IED-IR ($n = 16$; 29%) and PDC ($n = 7$;

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[2] The inclusion of education as a covariate did not alter the pattern of results for any of the outcome measures. Therefore, data are presented without education as a covariate.

[3] The inclusion of number of Axis I diagnosis as a covariate did not alter the pattern of results for any of the outcome measures. Therefore, data are presented without this as a covariate.

32%) groups did not differ in proportion of Cluster C personality disorders, $\chi^2(1, N = 78) < 1$. An independent samples t-test did not reveal a significant difference in the number of personality disorders in the IED-IR group ($M = 1.50$, SD $= 1.15$) compared to the PDC ($M = 1.05$, SD $= 0.38$) group, $t(76) = 1.68$, $p = 0.10$.

3.5. Self- and clinician-measures of aggression

3.5.1. Self-ratings: BPAQ

Of the 167 participants, 132 (HC, $n = 51$; AIC, $n = 25$; PDC, $n = 19$; IED-IR, $n = 37$) completed and returned the booklet with the BPAQ. A 4 (Diagnostic Status) $\times$ 2 (Gender) MANOVA on the four BPAQ scales revealed a significant multivariate effect of diagnostic status, Wilks $F(12, 330) = 9.27$, $p < 0.001$. Neither the multivariate effects of gender, nor Gender by Diagnostic Status were significant (Wilks $F < 1$). Subsequent univariate analyses revealed a significant effect of diagnostic status for each of the four BPAQ scales, physical aggressiveness [$F(3, 115) = 12.48$, $p < 0.001$, $\acute{\eta}_p^2 = 0.25$], verbal aggressiveness [$F(3, 115) = 14.22$, $p < 0.001$, $\acute{\eta}_p^2 = 0.27$], anger [$F(3, 115) = 25.10$, $p < 0.001$, $\acute{\eta}_p^2 = 0.39$], and hostility [$F(3, 115) = 35.47$, $p < 0.001$, $\acute{\eta}_p^2 = 0.48$]. See Table 6 for a list of group by BPAQ scale means and standard deviations. Post hoc analyses showed that IED-IR and PDC groups were higher than HC and AIC groups on each of the four scales. IED-IR and PDC subjects did not differ on physical or verbal aggression. However, the IED-IR group reported higher levels of hostility and a trend towards more anger (Tukey HSD, $p = 0.06$) than PDC subjects. The only other significant contrast was that HC subjects actually reported more physical aggression than AIC subjects.

3.5.2. Clinician ratings: LHA

A 4 (Diagnostic Status) $\times$ 2 (Gender) ANOVA of the aggression scale of the LHA showed a main effect of diagnostic status, $F(3, 159) = 117.78$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.69$). Post hoc analyses indicated that participants in the IED-IR group reported more aggressive acts ($M = 18.42$, SD $= 4.51$) than the PDC ($M = 8.95$, SD $= 3.31$), AIC ($M = 7.93$, SD $= 4.23$) or HC ($M = 5.16$, SD $= 3.04$) groups. Participants in the HC group also reported less aggression than the AIC or PDC groups. No other post hoc comparisons were significant. There was also a significant main effect of gender, $F(1, 159) = 3.98$, $p < 0.05$, ($\acute{\eta}_p^2 = 0.02$). Men reported more

aggressive acts ($M = 11.48$, SD $= 7.11$) than women ($M = 9.79$, SD $= 6.53$). There was no significant gender by diagnostic status interaction ($F < 1$).

3.6. Behavioral aggression: TAP shock selections

Before analyzing the data, TAP 20 shocks were recoded as 11 to minimize the influence of 20 shock selections on mean shock calculations (e.g., Myerscough and Taylor, 1985). Analyses were conducted using three TAP shock indices: (a) initial shock selection, (b) average shock selection, and (c) extreme (20) shock selection. Of special interest was the role of provocation (Blocks) in shock setting behavior.

3.6.1. Initial shock

Shock selection on the first trial (prior to any knowledge of the opponent's aggressive intent) provides an index of non-retaliatory aggression. Results of a 4 (Diagnostic Condition) $\times$ 2 (Gender) ANOVA revealed a significant effect of diagnostic status, $F(3, 159) = 7.83$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.13$). Post hoc tests indicated that the average initial shock administered in the IED-IR ($M = 4.67$, SD $= 3.53$) group was higher than that for the HC ($M = 2.27$, SD $= 2.17$) and AIC ($M = 2.96$, SD $= 1.92$) groups. The PDC group ($M = 3.50$, SD $= 2.17$) did not differ from any of the other diagnostic groups on initial shock administration. There was also a main effect of gender, $F(1, 159) = 6.96$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.04$). Men ($M = 4.00$, SD $= 3.05$) set higher initial shocks than women ($M = 2.71$, SD $= 2.43$). The diagnostic status by gender interaction was not significant ($F < 1$).

3.6.2. Mean shock

A $4 \times 2 \times 4$ (Diagnostic Condition $\times$ Gender $\times$ Block) mixed-model ANOVA for mean shock selection (Table 7) revealed a main effect for diagnostic group, $F(1, 159) = 17.34$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.25$). Post hoc analyses showed that IED-IR participants set higher ($M = 6.36$) shocks as compared to participants in the PDC ($M = 4.89$), AIC ($M = 4.22$), or HC ($M = 3.33$) conditions. PDC participants also set higher mean shocks compared to HC participants. There was also a main effect of provocation, $F(3, 477) = 142.62$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.47$). Mean shock increased significantly ($p < 0.008$) as provocation increased from Block 1 ($M = 3.21$) to Block 2 ($M = 4.27$) and from Block 2 to Block

Table 6
Mean (SD) BPAQ scale scores as a function of diagnostic group

	HC	AIC	PDC	IED-IR
Physical aggressiveness	14.30 (4.44)	10.82 (6.60)	16.22 (5.02)	19.35 (5.82)
Verbal aggressiveness	12.94 (4.37)	9.70 (6.16)	16.50 (6.03)	19.35 (7.02)
Anger	12.50 (4.40)	10.34 (5.77)	17.66 (5.72)	21.71 (6.43)
Hostility	10.46 (3.50)	11.91 (6.08)	17.83 (6.00)	23.57 (7.94)

Table 7
Mean (SD) shock selection as a function of diagnostic group, gender, and trial block

	Block 1	Block 2	Block 3	Block 4
HC				
Male	2.74 (2.03)	3.41 (2.19)	4.56 (2.90)	4.50 (3.08)
Female	1.67 (1.23)	2.51 (1.83)	3.39 (2.49)	3.59 (2.89)
Total HC	2.24 (1.77)	2.99 (2.06)	4.02 (2.76)	4.08 (3.00)
AIC				
Male	3.00 (1.58)	4.08 (1.98)	5.28 (2.92)	5.58 (2.97)
Female	2.45 (1.29)	3.55 (1.92)	5.07 (3.05)	5.01 (3.19)
Total AIC	2.68 (1.42)	3.77 (1.93)	5.16 (2.95)	5.25 (3.07)
PDC				
Male	3.69 (2.26)	4.50 (2.45)	5.56 (3.04)	5.19 (3.09)
Female	2.89 (1.73)	4.87 (2.03)	6.04 (2.83)	6.37 (2.54)
Total PDC	3.29 (2.01)	4.68 (2.20)	5.80 (2.87)	5.78 (2.82)
IED-IR				
Male	5.26 (3.38)	6.02 (2.54)	7.62 (2.19)	7.89 (2.32)
Female	3.48 (2.24)	5.23 (2.11)	7.46 (2.49)	7.57 (2.42)
Total IED-IR	4.47 (3.04)	5.66 (2.37)	7.55 (2.31)	7.75 (2.35)
Totals				
Male	3.81 (2.78)	4.60 (2.54)	5.91 (2.96)	5.99 (3.13)
Female	2.58 (1.81)	3.91 (2.25)	5.40 (3.10)	5.53 (3.19)
Grand total	3.21 (2.43)	4.27 (2.42)	5.66 (3.03)	5.76 (3.16)

3 ($M = 5.66$). The addition of the 20 shock extreme provocation did not result in a significant difference in mean shock from Block 3 to Block 4 ($M = 5.76$). There was a diagnostic group by provocation interaction, $F(9, 477) = 3.48$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.06$). Simple effects analyses showed a significant effect of diagnostic group at each level of trial block (all ps < 0.05). Post hoc analyses of the simple effects showed that during Blocks 1 and 2 IED-IR participants selected higher shocks than HC and AIC but not PDC (both ps > 0.17) groups. However, during Blocks 3 and 4 IED-IR individuals set higher shocks than all other groups. Thus, IED-IR individuals differed from PDC individuals in mean shock setting at higher levels of provocation.

There was also a gender by trial block interaction, $F(3, 477) = 3.82$, $p < 0.01$ ($\acute{\eta}_p^2 = 0.02$). Simple effects analyses showed that men set significantly higher shocks than women at Block 1, $F(1, 236) = 10.51$, $p < 0.005$. However men and women did not differ in shock setting at Block 2 [$F(1, 236) = 3.16$, $p = 0.08$], Block 3, [$F(1, 236) = 1.77$, $p = 0.18$], or Block 4 [$F(1, 236) = 1.44$, $p = 0.23$].

3.6.3. Extreme aggression (20 shocks)

Frequency of 20 shock administrations was analyzed using a 4 (Diagnostic Status) × 2 (Gender) × 4 (Provocation Block) ANOVA. There was a significant effect of Diagnostic Status, $F(3, 159) = 7.80$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.13$). Post hoc mean comparisons showed that the IED-IR group selected the 20 shocks more often for their opponent than did any of the other three diagnostic groups (see Fig. 1). HC, AIC, and PDC groups did
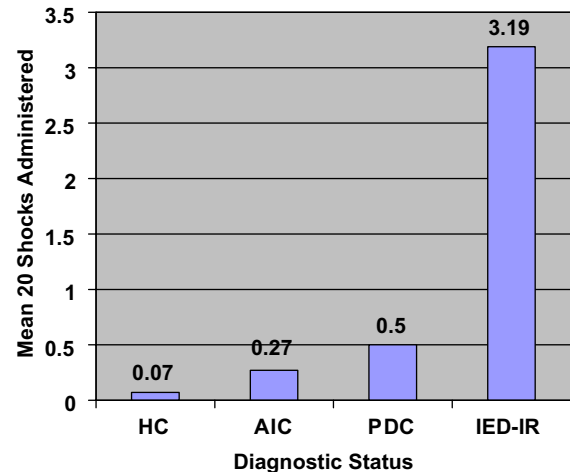

Fig. 1. Frequency of 20 shock administrations as a function of diagnostic status. Standard deviations for the diagnostic groups are as follows: HC = 0.26, AIC = 76, PDC = 1.22, IED-IR = 6.15.

not significantly differ from each other in their frequency of 20 shock selections. There was also a significant effect of Block, $F(3, 477) = 6.33$, $p < 0.001$ ($\acute{\eta}_p^2 = 0.04$). Bonferroni-corrected contrasts ($p = 0.008$) showed that the participants, overall, use the 20 shocks more frequently in Block 4 ($M = 0.46$, SD = 1.24) compared to either Block 1 ($M = 0.19$, SD = 0.92) or Block 2 ($M = 0.22$, SD = 1.02). Block 3 ($M = 0.34$, SD = 1.12) did not differ from the other blocks. The main effect of gender [$F(1, 159) = 2.98$, $p = 0.09$] and the gender by diagnostic status interaction [$F(3, 159) = 2.45$, $p = 0.07$] were not significant.

3.7. Psychosocial functioning (GAF)

Results of a one-way ANOVA comparing GAF scores for the four groups was significant, $F(3, 163) = 111.03$, $p = 0.001$ ($\acute{\eta}_p^2 = 0.67$). Post-hoc analysis showed that participants in the IED-IR group had a lower GAF ($M = 61.27$, SD = 7.08) than participants in the AIC ($M = 77.24$, SD = 10.46) or HC ($M = 86.21$, SD = 6.21) groups. GAF scores of IED-IR participants did not differ from those of participants in the PDC group ($M = 63.95$, SD = 8.00). HC and AIC groups had higher GAFs than the PDC group, and GAFs in the HC group were higher than those in the AIC group.

3.8. IED sub-group analysis: DSM-IV IED vs. IED-IR-only

3.8.1. Characteristics of the sample

Of the 56 IED-IR participants, 26 also meet DSM-IV criteria for IED. Of the 30 participants who failed to meet DSM-IV criteria, 25 did not meet criteria due to a diagnosis of Borderline Personality Disorder ($n = 10$), Antisocial Personality Disorder ($n = 12$), or both ($n = 3$). Eight participants did not meet DSM criteria

because they only exhibited verbal aggression, with three of these participants meeting both exclusionary criteria. IED-IR participants who also meet the narrower DSM-IV criteria will be referred to as DSM-IV IED in this section. IED-IR participants who do not meet DSM-IV criteria will be simply referred to as IED-IR.

3.8.2. Demographic variables

DSM-IV IED participants did not differ from IED-IR participants in terms of age [$t(54) < 1$], gender [$\chi^2(1, N = 56) < 1$], race [$\chi^2(1, N = 56) = 2.89, p = 0.09$] or education [$\chi^2(1, N = 56) < 1$].

3.8.3. Axis I psychopathology

DSM-IV IED and IED-IR groups did not differ in prevalence of co-morbid Axis I diagnoses across the major diagnostic categories [DSM-IV IED = 85%; IED-IR = 90%, $\chi^2(1, N = 56) < 1$]. However, IED-IR participants had, on average, more co-morbid Axis I disorders ($M = 2.43$, SD = 1.34) than DSM-IV IED participants ($M = 1.65$, SD = 1.32), $t(54) = 2.08, p < 0.05$.

3.8.4. Axis II psychopathology

IED-IR participants were more likely to have a personality disorder (96%) than DSM-IV IED participants (65%) were, $\chi^2(1, N = 56) = 9.29, p < 0.005$. However, in accordance with DSM-IV criteria, this study considered BPD or ASPD as exclusionary for DSM-IV IED. Examining the prevalence of all personality disorders other than Borderline or Antisocial Personality Disorder across IED subgroups, IED-IR (70%) and DSM-IV IED (65%) did not differ, $\chi^2(1, N = 56) < 1$.

3.8.5. Behavioral aggression: initial shock

A 2 (IED subtype) × 2(Gender) ANOVA failed to reveal a significant effect of IED subtype, $F(1, 52) = 1.02, p = 0.37$. DSM-IV IED participants ($M = 5.31$, SD = 3.37) and IED-IR-only participants ($M = 4.13$, SD = 3.65) did not differ in their initial shock selections. There was also no effect of Gender, $F(1, 52) = 1.84, p = 0.18$. Men ($M = 5.29$, SD = 3.69) did not set significantly higher shocks than women ($M = 3.92$, SD = 3.25). The IED subtype by gender interaction was also not significant, $F(1, 52) < 1$.

3.8.6. Behavioral aggression: mean shock

A 2 (IED subtype) × 2(Gender) × 4 (Provocation Block) repeated measures ANOVA revealed a significant effect of block, $F(3, 156) = 68.82, p < 0.001$ ($\eta_p^2 = 0.57$). Bonferroni-corrected contrasts ($p = 0.008$) indicated that participants overall increased their shock selections as provocation increased from Block 1 to Block 2, and from Block 2 to Block 3 (see Table 8). There was no significant difference from Block 3 to Block 4. Block 4 also elicited significantly higher shocks than Block 1 or Block 2. There was no significant main effect for IED subtype

Table 8
Mean (SD) shock selection as a function of IED subtype, gender, and trial block

	Block 1	Block 2	Block 3	Block 4
DSM-IV IED				
Male	5.86 (3.48)	6.22 (2.58)	7.89 (2.26)	8.21 (2.27)
Female	2.95 (2.24)	4.61 (2.20)	6.43 (3.34)	6.61 (3.55)
Total DSM-IV IED	4.74 (3.34)	5.60 (2.52)	7.33 (2.76)	7.60 (2.87)
IED-IR				
Male	4.63 (3.28)	5.80 (2.56)	7.33 (2.15)	7.54 (2.39)
Female	3.84 (2.24)	5.64 (2.01)	8.14 (1.50)	8.21 (0.94)
Total IED-IR	4.23 (2.79)	5.72 (2.26)	7.73 (1.86)	7.87 (1.82)
Totals				
Male	5.26 (3.38)	6.02 (2.54)	7.62 (2.19)	7.89 (2.32)
Female	3.48 (2.24)	5.23 (2.11)	7.46 (2.49)	7.57 (2.42)
Grand total	4.47 (3.04)	5.66 (2.37)	7.87 (1.82)	7.75 (2.35)

($F < 1$), or Gender, $F(1, 52) = 2.21, p = 0.15$. There was a significant block by gender interaction, $F(3, 156) = 3.23, p < 0.05$ ($\eta_p^2 = 0.06$). Simple effects analysis showed that IED men set significantly higher shocks at Block 1 (low provocation), $F(1, 87) = 6.84, p < 0.05$. However, IED men and IED women did not differ in shock settings for Block 2 [$F(1, 87) = 1.34, p = 0.25$], Block 3 [$F(1, 87) < 1$], or Block 4 [$F(1, 87) < 1$]. No other interactions were significant (all ps > 0.10).

3.8.7. Extreme shock

A 2 (IED subtype) × 2 (Gender) × 4 (Provocation Block) ANOVA was performed on the number of extreme ("20") shocks used. There was a main effect of Block, $F(3, 156) = 3.40, p < 0.05$ ($\eta_p^2 = .06$). Bonferroni-corrected contrasts ($p = 0.008$) showed a non-significant trend ($p = 0.01$) towards more extreme shocks for Block 4 ($M = 1.09$, SD = 1.89) than for Block 1 ($M = 0.57$, SD = 1.52). No contrasts involving Block 2 ($M = 0.63$, SD = 1.69) or Block 3 ($M = 0.91$, SD = 1.76) approached significance. There was also a main effect of gender, $F(1, 52) = 4.32, p < 0.05$, ($\acute{\eta}_p^2 = 0.08$) with men setting more extreme shocks ($M = 1.61$, SD = 2.25) than women ($M = 0.44$, SD = 1.04). The main effect of IED subtype was not significant (DSM-IV IED: $M = 1.12$, SD = 1.93; IED-IR: $M = 1.07$, SD = 1.89), $F(1, 52) < 1$. No interactions were significant (all ps > 0.30).

3.8.8. Self-reported trait aggression: BPAQ

A 2 (IED subtype) × 2 (Gender) MANOVA on the four BPAQ scales failed to indicate a significant effect of IED subtype, Wilks $F(4, 21) = 1.61, p = 0.20$. Neither the gender main effect nor the Gender by IED subtype interaction were significant, both Wilks $F < 1$.

3.8.9. Clinician-rated aggression: LHA

IED-IR participants reported more aggressive acts ($M = 19.60$, SD = 4.35) than DSM-IV IED participants ($M = 17.07$, SD = 4.39), $t(54) = 2.15, p < 0.05$ ($d = 59$).

3.8.10. Psychological impairment: GAF

No differences in global assessment of functioning were found between DSM-IV IED ($M = 61.92$, SD = 6.97) and IED-IR ($M = 60.70$, SD = 7.25) participants, $t(54) < 1$.

4. Discussion

The validity of a new criteria set for intermittent explosive disorder (IED-IR) was examined by: (a) comparing IED-IR participants to three diagnostic groups (HC, AIC, and PDC) and (b) comparing DSM-IV IED participants to IED-IR participants who did not meet DSM-IV criteria. Outcome measures included behavioral, clinician, and self-reported aggression as well as level of psychosocial impairment. The current study surpassed a limitation of previous studies in this area (e.g., Coccaro et al., 1998) by including a behavioral measure of aggression. This study also represents the first published evaluation of IED-IR criteria validity.

We hypothesized that IED-IR participants would demonstrate higher levels of behavioral aggression in the laboratory as compared to participants in the other diagnostic conditions. This hypothesis was supported, providing evidence for the discriminant validity of the IED-IR criteria. Specifically, participants in the IED-IR condition selected higher average shocks on the TAP, and were at least six times more likely to select an extreme shock for their opponent in response to provocation than participants in any of the other conditions. These findings support the theory that individuals with IED-IR are more likely to respond to even minor provocation aggressively, and suggest that one way in which individuals with IED-IR may differ from individuals with other psychological disorders is their willingness to engage in more extreme forms of aggression.

IED-IR participants also selected a higher initial shock for their opponent on the TAP in comparison to individuals in the HC or AIC conditions, but not in comparison to PDC participants. Given that initial shock selection occurs before receiving feedback about an opponent's aggressive intent, it is not as pure a measure of impulsive, reactive aggression as the other TAP shock indices. This provides preliminary evidence that, although IED-IR participants may exhibit more overall aggression than participants with other conditions, the differences in aggressiveness between IED-IR individuals and those with personality disorders may be more context dependent, with IED-IR participants being: (a) more likely to resort to extreme aggression and (b) more reactive to external provocation. This hypothesis is supported by the finding that IED-IR participants set significantly higher shocks than PDC participants only under higher levels of provocation.

The self-report data parallel the behavioral findings. IED-IR participants reported more than twice the number of past aggressive acts of participants in any of the other three conditions. It could be argued that this evidence is somewhat circular, as self-reported number of aggressive acts is used to derive the IED diagnosis. However IED-IR participants also reported greater levels of hostility and anger than participants in any of the other conditions. In fact, it was the anger and hostility scales, not the physical and verbal aggressiveness scales of the BPAQ that best discriminated IED-IR and PDC subjects. This replicates and extends other studies of self-reported aggression using DSM (Posternak and Zimmerman, 2002) and Research (Coccaro et al., 1998) IED criteria sets. Thus discriminant validity for the diagnostic category IED-IR was found for both behavioral and self-report measures.

In terms of psychosocial functioning, IED-IR participants reported mild to moderate impairment in social and occupational functioning and were significantly more impaired than their HC or AIC counterparts, with GAF scores comparable to that of the PDC participants. This is consistent with previous research (e.g., McElroy et al., 1998) that has shown the deleterious impact of impulsive aggression on personal and professional relationships. IED-IR participants also reported more co-morbid lifetime Axis I disorders than either the AIC or PDC groups. However, diagnostic co-morbidity does not appear to fully account for the increased aggressiveness and decreased GAF scores observed in the IED-IR participants, as including the number of Axis I diagnoses as a covariate did not change the pattern of results for any of the outcome measures. The above findings underscore the importance of treatment for IED-IR individuals, as well as the need for a psychiatric diagnostic criteria set to identify them.

We hypothesized that individuals who met diagnostic criteria for IED-IR would be more aggressive and impaired in comparison to individuals who did not meet IED-IR criteria irrespective of whether the IED-IR individuals also met criteria for DSM-IV IED. This hypothesis was supported. Moreover, DSM-IV IED participants did not differ from other IED-IR individuals on any of the three behavioral measures of aggression, with the two groups averaging almost identical mean shocks and extreme shocks. Nor did the two groups differ in level of self-reported aggression, anger or hostility. The IED-IR group did not vary from the DSM-IV IED group in terms of psychosocial functioning. The only study outcome measure in which the two groups differed was frequency of aggression where IED-IR individuals reported more aggressive acts than the DSM-IV IED group. Taken in total, these findings suggest that IED-IR participants who do not meet DSM-IV criteria are as aggressive, and consequently

as impaired, as DSM-IV IED participants, thus providing convergent validity for the IED-IR criteria.

The study results support the notion that a broader spectrum of adults with clinically relevant impulsive aggression could be identified as IED by eliminating the vague DSM exclusionary criteria "not better accounted for by Antisocial or Borderline Personality Disorder," and including less severe, but more frequent acts of aggression. Recent studies estimate the prevalence of DSM-IV IED at approximately 4% of the general population (Coccaro et al., 2004) and 6% of clinic patients (Coccaro, 2003). The current results, however, suggest that DSM-IV IED criteria may significantly underestimate pathological impulsive aggression. This translates into millions of individuals potentially being misdiagnosed or underdiagnosed and consequently receiving sub-optimal (or no) treatment. The adoption of the less restrictive IED-IR diagnostic criteria in clinical settings would serve to help identify and treat pathological aggression in these individuals. Likewise, implementation of IED-IR criteria in clinical research would inform the scientific community as to the scope, etiology and treatment of this still poorly understood disorder. For example, pilot research by the authors provided initial support for the use of a multi-component cognitive-behavioral treatment for IED-IR (McCloskey et al., 2004).

The results of this study provide preliminary evidence for the validity of the IED-IR criteria set in the diagnosis of pathological impulsive aggression. Strengths of the study include comparisons with both Axis I and Axis II diagnostic groups and the use of a laboratory measure of aggressive behavior. However, aspects of the study may limit the generalizability of these results. For example, we excluded individuals with psychosis or bipolar disorder, conditions that have been associated with increased aggressiveness (Arseneault et al., 2000; Posternak and Zimmerman, 2002). Because IED-IR is by definition a non-psychotic disorder that shares no co-morbidity with schizophrenia or other psychotic disorders, all of our studies to date have only compared patients with IED-IR to other non-psychotic individuals.

The exclusion of individuals diagnosed with bipolar disorder is more limiting. Some researchers have found that a substantial proportion of adults meeting DSM-IV IED criteria also have a lifetime bipolar disorder diagnosis, which led to the speculation that IED was a subtype of bipolar disorder (McElroy, 1999). To establish the existence of IED independent of bipolar disorder, potential IED individuals are excluded from our studies if they met lifetime criteria for bipolar disorder. This has had the consequence of eliminating bipolar participants as a comparison group. Also, the limited number of non-IED participants with Axis I only or Axis II disorders precludes comparisons of IED-IR to specific diagnostic entities (e.g., Major Depression or Borderline Personality Disorder). Comparing IED-IR against a cross section of Axis I and Axis II disorders, however, has the advantage of improving the generalizability of the results. Future research in this area could be enhanced by comparisons to specific diagnostic categories that are co-morbid with IED-IR.

The limited number of IED-IR participants prevented the separate comparisons of IED-IR individuals who did not meet DSM-IV IED criteria due to ASPD/BPD and those who did not meet DSM-IV IED diagnosis due to subthreshold physical aggression. It is possible that these two subtypes present different aggression and impairment profiles, potentially suggesting different etiologies and treatment options. Research is currently being conducted to allow the investigators to address this question.

The investigators failed to find any differences between individuals with DSM-IV IED (in addition to IED-IR) to those with only IED-IR on any of the behavioral indices of aggression. The power to detect an effect may have been limited by the relatively small sample ($n = 56$) of eligible IED-IR participants. However, the investigators believe that the near complete lack of an IED subgroup effect on measures of behavioral aggression or functional impairment, as well as the finding that participants with IED-IR (but not DSM-IV IED) reported more lifetime aggressive acts, provides strong preliminary evidence that IED-IR participants who do not have DSM-IV IED are not significantly less aggressive or impaired than DSM-IV IED participants. Results also showed that individuals identified as IED using the broader criteria set (IED-IR) were more aggressive than HC, AIC, and PDC individuals. IED-IR participants failing to meet criteria for DSM-IV IED were found to be at least as aggressive and impaired as IED-IR participants who did meet DSM-IV criteria. Additional research, including replication with larger samples and studies that employ more specific measures of the impact of aggressive behavior on quality of life is required to substantiate the current findings. However, if future studies reliably show that IED-IR subjects demonstrate clinically significant levels of aggression-related pathology, then serious consideration should be made to broadening the IED criteria to facilitate our efforts to identify and treat individuals with pathological impulsive aggression.

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