ELSEVIER

Psychiatry Research 101 (2001) 259–267

PSYCHIATRY RESEARCH

www.elsevier.com/locate/psychres

Validation of the Interview Module for Intermittent Explosive Disorder (M-IED) in children and adolescents: a pilot study

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Received 25 July 2000; received in revised form 11 January 2001; accepted 14 January 2001

Abstract

We identified a subset of impulsive, aggressive children as having symptoms that met criteria for Intermittent Explosive Disorder (IED) using the Interview Module for Intermittent Explosive Disorder (M-IED). The M-IED was administered to 34 children and adolescents between the ages of 10 and 17. These data provide initial evidence for the M-IED as a useful instrument in the diagnosis of IED in adolescents. The M-IED displayed a high level of inter-rater reliability and adequate test–retest reliability. Construct validity was supported by the fact that the subjects with IED symptomatology had significantly more lifetime aggression, oppositionality, inattention and hyperactivity/impulsivity compared to community controls. In addition, the subjects with IED symptomatology had a significantly greater number of episodes of lifetime physical aggression and documented episodes of aggression while in residential treatment compared to psychiatric controls. The subjects with IED symptomatology had a greater number of positive screening questions for DSM-IV diagnoses using the Swanson, Nolan and Pelham questionnaire (SNAP-IV), particularly those related to IED and posttraumatic stress disorder than psychiatric controls.

Keywords: Intermittent explosive disorder; Aggression; Diagnostic instrument

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0165-1781/01/$ - see front matter
PII: S0165-1781(01)00224-4

1. Introduction

Intermittent Explosive Disorder (IED) is characterized by discrete episodes of aggressive impulses that result in serious assaultive acts toward people or destruction of property. As specified in DSM-IV, these aggressive acts are grossly out of proportion to the precipitating psychosocial stressor and are not better accounted for by another mental condition. More than a decade ago, a single study estimated the incidence of IED to be between 0.1 and 2.4% when inpatient psychiatric records were reviewed and compared to the DSM-III criteria for IED (Monopolis and Lion, 1983).

Violent behavior in adolescents is a major public health issue (Stanton et al., 1997). IED, however, has not been studied in adolescence despite evidence that this disorder begins during these years. In a literature review of Impulse Control Disorders, McElroy et al. (1992) noted that IED or episodic aggressive outbursts often began in childhood, adolescence or early adulthood and followed a chronic course. In a further study, three-quarters of 27 subjects who met DSM-IV criteria for IED reported their explosive behavior began in adolescence, with the mean age of onset being 14 years of age (McElroy et al., 1998).

Recent attempts to clarify the subtypes of aggression in children and adolescents have suggested the following broad categories: an impulsive–reactive–hostile–affective subtype (RA); a controlled–proactive–instrumental–predatory subtype (PA); and a mixed group that displays both features (Vitiello and Stoff, 1997). Dodge et al. (1997) classified both a large population of third graders and a group of juvenile offenders as showing either proactive or reactive aggression. In the sample of third graders, the reactive aggressive group demonstrated more aggressive problem-solving responses, while the proactive aggressive children anticipated positive outcomes for aggression. In the juvenile sample more encoding errors, judged by the ability to remember details of video vignettes, were found in the reactive aggressive children. Reactive aggressive adolescents are described as explosive, with poor impulse control. Based on animal models, this behavior is thought to be primarily defensive in nature, driven by fear, anger and cognitive distortion of environmental circumstances, with high levels of autonomic arousal (Vitiello and Stoff, 1997). McElroy et al. (1998) noted adults with IED consistently described their aggression as defensive, as an 'adrenaline rush', and as having a high affective component, i.e. rage. It is possible that these highly impulsive aggressive children have a high degree of overlap with IED.

Insufficient impulse control is associated with poor outcomes in pediatric populations. Steiner et al. (1999) used the Weinberger Adjustment Inventory to classify delinquents into four groups based on distress and restraint. Youths with low levels of restraint were more likely to have prior convictions and to receive punishment while incarcerated. The two low restraint groups, a nonreactive (low restraint, low distress) and the reactive group (low restraint, high distress), had the highest level of recidivism with 88.9 and 71% being rearrested after 4 years, respectively. Evidence suggests that many of these children with poor impulse control suffer from Attention Deficit Hyperactivity Disorder (ADHD). Atkins and Stoff (1993) have classified children into subtypes of hostile aggression (intended to inflict injury or pain) and instrumental aggression (which provides reward or advantage to the aggressor). They reported that the hostile aggressive group had higher levels of poor impulse control (Atkins et al., 1993), as well as problems with ADHD (Atkins and Stoff, 1993). In two separate studies, children with the combination of Conduct Disorder and Attention Deficit Hyperactivity Disorder (CD/ADHD) had a greater occurrence of becoming delinquent (Farrington et al., 1989) and of being multiple offenders (Loeber et al., 1988), compared to controls, and children with either CD or ADHD alone.

Research on IED in pediatric populations has been severely hampered by lack of a valid and reliable instrument to make the diagnosis in children. Coccaro et al. (1998) devised the M-IED in adults with personality disorders. He used the 'Revised criteria' whereby episodes of severe verbal aggression were included for caseness (see Table 1). In this study, the IED-Revised subjects

Table 1
Diagnostic criteria for the IED-R (Coccaro et al., 1998)

A	Recurrent incidents of verbal or physical aggression towards other people, animals, or property.
B	The degree of aggressive behavior is out of proportion to the provocation
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).
D	Aggressive outbursts occur twice a week, on average, for at least 1 month.
E	Aggressive behavior is not better accounted for by mania, major depression, or psychosis. It is not solely due to the direct physiological effect of a substance (e.g. of drug abuse) or general medical condition (e.g. closed head trauma, Alzheimer's).
F	The aggressive behavior causes either marked distress (in the individual) or impairment in occupational or interpersonal functioning.

had higher scores on measurements of aggression and impulsivity. In addition these subjects had more current Axis I symptoms, especially depression and dysthymia (Coccaro et al., 1998). Validation of this tool in children and adolescents could provide us with a useful tool in further studying the phenomenology and etiology of IED in this population.

The purpose of this study was to test the utility of the M-IED in children ages 10–17, by documenting the inter-rate reliability, test-retest reliability and validity of the instrument. We hypothesized construct validity would be shown by:

1. the subjects with IED symptomatology having histories of more physical aggression as reported by their parent or therapist;
2. the subjects with IED symptomatology having more documented episodes of aggressive outbursts; and
3. a larger proportion of the subjects with IED symptomatology requiring neuroleptics or mood stabilizers.

We hypothesized discriminant validity would be displayed by:

1. the subjects with IED symptomatology having more current comorbid psychiatric symptoms; and
2. the subjects with IED symptomatology having more problems with impulse control as measured by inattention and hyperactivity.

2. Methods

2.1. Subjects

The study sample consisted of 34 adolescents between the ages of 10 and 17 years (24 residential treatment patients and 10 community controls). The directors of two residential facilities were asked to select two study groups consisting of aggressive children and children who suffer from various disorders representative of the population at the center. Community controls were recruited by a local advertisement asking for subjects with 'no previous history of severe chronic aggression, psychiatric problems, or arrests'. Subjects with a known history of mental retardation or schizophrenia were excluded from the study. Signed informed consent was obtained from the subject's parent or guardian, and signed assent was obtained from the subject. This project was approved by the Institutional Review Board of this institution.

2.2. Assessment

The Module for Intermittent Explosive Disorder (M-IED) (Coccaro et al., 1998) was administered to these children by raters who were blind to their diagnoses and selection status. The M-IED is based on the Structured Clinical Interview for DSM-III-R (SCID), and attempts to empirically study IED and refine the diagnosis based on

inclusionary and exclusionary criteria focusing on frequency of outbursts, level of aggression, and level of social impairment (see Table 1). The questionnaire allows informants to describe three of their most severe episodes of verbal aggression, physical aggression and destruction of property. As the DSM-IV criteria require the episodes to be 'impulsive' and clearly excessive to the given provocation, subjects describe in detail the provocation and their response. Further questions assess qualities of the outburst including: how quickly they explode, how long it takes them to calm down, and feelings experienced before, during, and after an outburst. In addition to the vignettes, the following screening question was used to assess whether these outbursts were not better explained by another DSM-IV diagnosis: Do you feel your typical outburst is due to:

Feeling depressed or sad?
Being high on drugs or alcohol?
Hearing voices or seeing things?
Because you were off your medications?

If a subject or his/her parent/therapist answers 'yes' to any of the screening questions, the subject is automatically excluded as having IED. We used the Research/Phenomenology version, which contains 42 items. For our purposes only subjects who met criteria based on episodes of physical aggression or destruction of property were labeled as IED, as these criteria are closer to the DSM-IV definition. The broader classification (including verbal aggression) was labeled as IED-Revised (IED-R) for comparison purposes.

Half of these subjects were videotaped during the initial M-IED interview. This videotape was then watched by another blind rater who scored the M-IED in order to determine inter-rater reliability. The other half of the subjects were interviewed again approximately 4 weeks later by another blind rater in order to determine test–retest reliability. We used the results from the initial interview for the analyses of validity.

The residential treatment center subjects' therapist and a control patient's parent completed the Swanson, Nolan and Pelham (SNAP) Questionnaire (Swanson, 1992) and were administered the M-IED parent version. The SNAP-IV is based on symptoms listed in the DSM-IV and includes the criteria for ADHD and Oppositional Defiant Disorder (ODD). In addition, the SNAP-IV contains forty questions that are used to screen for other disorders that may mimic or co-occur with ADHD and ODD. The SNAP-IV provides separate indexes on oppositionality, inattention and hyperactivity/impulsivity. Symptoms from the SNAP-IV were used to assess discriminant validity. The M-IED parent version was compared to the child's initial interview to test for agreement. Lifetime verbal and physical aggressive episodes were taken from the M-IED parent version. A chart review was done after the interviews noting the residential treatment center subject's medications, and documented incidents of verbal and physical aggression during the first month's stay in placement.

All raters were trained by RO and SP, board-certified child and adolescent psychiatrists, on the M-IED using mock interviews.

2.3. Data analyses

All data were entered into a SYSTAT database. Agreement was measured using the kappa statistic. Nominal variables were compared using chi-square analyses for differences between two groups and logistic regression analyses for multiple comparisons. Continuous variables were compared using *t*-test analyses for differences between two groups and ANOVAs with Bonferroni corrections for multiple comparisons. Significance was set at alpha = 0.05. We used two-sided alphas for ANOVA and *t*-tests, and a one-sided alpha for chi-square comparisons.

3. Results

There were no significant differences comparing subjects on sex, age, or ethnicity (see Table 2). Eight adolescents (23.6%) met criteria for IED. Inter-rater reliability resulted in a $\kappa = 0.87$. Test-retest reliability resulted in a $\kappa = 0.43$ (see Tables

Table 2
Demographic variables[a]

	IED ($n = 8$)	PC ($n = 16$)	CC ($n = 10$)
Sex			
Male	5 (65%)	12 (75%)	5 (50%)
Female	3 (35%)	4 (25%)	5 (50%)
Mean age + (S.D.)	13.9 ± (2.4)	13.3 ± (1.8)	14.9 ± (2.6)
Ethnicity			
Non-Hispanic white	2 (25%)	7 (44%)	1 (10%)
Hispanic	5 (63%)	3 (19%)	9 (90%)
African–American	1 (13%)	6 (37%)	0

[a]*Abbreviations:* IED, Intermittent Explosive Disorder; PC, psychiatric controls; CC, community controls.

3 and 4). The level of agreement between the adolescent and therapist/parent interview yielded a $\kappa = 0.53$.

Construct validity was displayed by the subjects with IED symptomatology having significantly higher levels of verbal aggression, temper tantrums, physical aggression, destruction of property, oppositionality, inattention and hyperactivity/impulsivity compared to community controls (see Table 5). In addition, subjects with IED symptomatology had a significantly greater number of reported episodes of lifetime physical aggression, verbal aggression and psychiatric symptoms compared to both community and psychiatric controls (see Table 5). On chart review, the subjects with IED symptomatology averaged three times as many episodes of physical aggression (0.75 per week) compared to psychiatric controls (0.23 episodes per week) ($t = -2.20$, $P = 0.04$). Although the IED group averaged twice as many episodes of verbal aggression (1.8 per week vs. 0.9 per week), compared to psychiatric controls, the difference was not significant at the $P = 0.05$ level. The subjects with IED symptomatology differed from psychiatric controls with significantly greater odds ratios for positive responses to the screening questions of IED, posttraumatic stress disorder (PTSD), and adjustment disorder (see Table 6). Five (63%) of the subjects with IED symptomatology were on mood stabilizers compared to seven (44%) of the psychiatric controls. Three (38%) of the subjects with IED symptomatology were on neuroleptic medications compared to five (32%) of the psychiatric controls. These differences were not statistically significant on chi-square analyses.

Twelve subjects (35.3%) met criteria for IED-R, using the broader definition of IED to include verbal aggression. Using the IED-R classification

Table 3
M-IED inter-rater reliability

	IED			IED-R		
Subject Time 1	Subject Time 2		$\kappa = 0.87$	Subject Time 2		$\kappa = 0.76$
	Yes	No	Total	Yes	No	Total
Yes	6 (35%)	0 (0%)	6 (35%)	6 (35%)	0 (0%)	6 (35%)
No	1 (6%)	10 (59%)	11 (65%)	2 (12%)	9 (53%)	11 (65%)
Total	7 (41%)	10 (59%)	17 (100%)	8 (47%)	9 (53%)	17 (100%)

Table 4
IED test-retest reliability

	IED			IED-R		
Subject Time 1	Subject Time 2		$\kappa = 0.43$	Subject Time 2		$\kappa = 0.63$
	Yes	No	Total	Yes	No	Total
Yes	1 (6%)	1 (6%)	2 (12%)	5 (29%)	1 (6%)	6 (35%)
No	1 (6%)	14 (82%)	15 (88%)	2 (12%)	9 (53%)	11 (65%)
Total	2 (12%)	15 (88%)	17 (100%)	7 (41%)	10 (59%)	17 (100%)

changed the inter-rater and test-retest reliability to $\kappa = 0.76$ and 0.63, respectively (see Tables 3 and 4). For the IED-R, the level of agreement between the adolescent and therapist/parent interview yielded a $\kappa = 0.52$. The IED-R criteria differentiated subjects compared to community controls in an identical manner to the IED criteria. Similarly, IED-R subjects had a greater number of lifetime physical aggressive episodes compared to psychiatric controls ($P = 0.002$) and community controls ($P = 0.000$) on ANOVA with Bonferroni correction ($F = 13.86$, d.f. $= 2$, $P = 0.000$). However, the IED-R criteria displayed decreased construct validity as the IED-R subjects did not have significantly more episodes of physical aggression (0.5 vs. 0.3 per week) or verbal aggression (1.6 vs. 0.7 per week), compared to psychiatric controls. Based on the SNAP questionnaire, IED-R subjects did not have more psychiatric symptomatology compared to psychiatric controls (5.17 vs. 3.92).

4. Discussion

Our findings suggest that adolescents who endorsed IED criteria overlap with the reactive

Table 5
ANOVAs of parent/therapist reported parameters[a]

	IED ($n = 8$)	Psychiatric controls ($n = 16$)	Community controls ($n = 10$)	F	P
Lifetime verbal aggression	76.88[a] (36.11)	35.5[b] (35.61)	1.40[c] (3.13)	13.89	0.000
Lifetime temper tantrums	61.60[a] (38.84)	39.75[a] (43.18)	1.00[b] (2.11)	7.04	0.003
Lifetime physical aggression	63.50[a] (26.44)	16.87[b] (22.31)	0.40[b] (0.52)	23.61	0.000
Lifetime destruction of property	32.13[a] (28.42)	14.00[a,b] (26.63)	0[b]	4.36	0.021
Mean positive screening responses	7.00[a] (2.62)	3.31[b] (2.68)	1.00[b] (2.11)	12.03	0.000
Inattention Index	1.31[a] (0.63)	1.05[a,b] (0.73)	0.42[b] (0.47)	4.782	0.015
Hyperactivity Impulsivity Index	1.17[a] (0.83)	0.66[a,b] (0.63)	0.34[b] (0.53)	3.55	0.041
Oppositional Defiant Index	2.07[a] (0.73)	1.25[a,b] (0.93)	0.38[b] (0.55)	10.24	0.000

[a] Groups with different superscripts differ from each other (Bonferroni adjustment, $P < 0.05$). Standard deviations are in parentheses.

Table 6
Univariate logistic regression: DSM-IV IED and SNAP symptoms

SNAP-IV	IED ($n = 8$)	PC ($n = 16$)	CC ($n = 10$)	OR (95% CI)	*P*
IED	6[a] (75%)	1 (6%)	0	45.0 (3.41–594.12)	0.004
PTSD	6[a] (75%)	4 (25%)	2 (20%)	9.0 (1.26–63.89)	0.028
Adjustment Disorder	6[a] (75%)	4 (50%)	0	9.0 (1.27–63.90)	0.028
GAD	8 (100%)	11 (69%)	2[a] (20%)	0.11 (0.02–0.74)	0.023
CD	5 (63%)	5 (31%)	2 (20%)	NS	NS
Mania	4 (50%)	3 (19%)	2 (20%)	NS	NS
MDD	6 (75%)	6 (38%)	0	NS	NS
Dysthymia	6 (75%)	8 (50%)	0	NS	NS
Personality disorder	6 (75%)	10 (63%)	0	NS	NS
OCD	2 (25%)	2 (20%)	2 (20%)	NS	NS

Abbreviations: IED, Intermittent Explosive Disorder: SNAP, Swnson, Nolan and Pelham Questionnaire; PC, psychiatric control; OR, odds ratio; CI, confidence interval.
[a]Significant difference from PC used as reference group.

aggression subtype of aggressive children. As expected, IED children scored highest on indexes of inattention and hyperactivity/impulsivity. We also found that subjects with IED symptomatology scored highest on the oppositional defiant index yet did not have higher rates of CD symptoms according to the SNAP-IV. Similarly, Vitaro et al. (1998) found that reactive aggression (RA) was associated with oppositional defiant symptoms whereas proactive aggression (PA) was associated with future CD. In the study by Dodge et al. (1997), they suggest that RA stems from early life experiences, whereas PA stems from social learning. These findings suggest that RA children may find themselves in the juvenile justice system or in treatment settings due to aggressive behaviors that stem from poor impulse control whereas PA children violate societal norms with expectation of positive outcomes for their actions. As most of the subjects in this study were in the custody of Child Protective Services, we were not surprised to see a high prevalence of PTSD symptoms. Our finding of increased risk for PTSD in subjects with IED symptomatology is consistent with Dodge et al. (1997), who noted a distinguishing feature of RA subjects compared to PA children was histories of physical abuse and exposure to violence. Gomes-Schwartz et al. (1985) studied recently abused children and adolescents. They found that within the school-aged (7–13-year-old) population, 50% showed serious difficulties with infantile aggression (belligerent self-centered behavior), 45% with antisocial behavior (illegal and destructive behavior), and 45% with aggression (impulsive aggression). Kendall-Tackett et al. (1993) reviewed 45 studies of sexually abused children, and noted the highest effect sizes for problem behaviors were for sexualized behaviors and aggression. Sexual abuse accounted for 43% of the variance for these two behaviors. Both clinical samples had a high prevalence of GAD symptoms, but only the subjects with IED symptomatology had a significantly higher risk for PTSD symptoms. Whether the anxiety reported by the IED and psychiatric control groups differs in etiology or stems from the same illness, with the IED group being more severely affected, could not be determined from this study.

Similar to adult IED studies (Coccaro et al., 1998; McElroy et al., 1998), we found high levels of comorbid mood symptoms in children with IED. Seventy-five percent of IED patients had positive responses to the screening questions for MDD or dysthymia, and 50% for Mania. Numerous studies have identified high levels of overlap between manic symptoms and CD in adolescents (Kovacs and Pollock, 1995; Lewinsohn et al., 1995; Biederman et al., 1999; Wilens et al., 1997). Chil-

dren with adolescent onset bipolar symptoms have been found to display high levels of aggression (Biederman et al., 1999; McGlashan, 1988). Biederman et al. (1996, 1999) have found high comorbidity of CD, manic symptoms and ADHD, and suggest that there may be a discrete disorder of affective regulation, aggression, inattention, and hyperactivity that meets criteria for mania.

4.1. Significance / limitations

These pilot data provide initial evidence for the M-IED as a useful instrument in the assessment of IED in adolescents. The M-IED displayed a high level of inter-rater reliability and adequate test-retest reliability. These values compare favorably with similar numbers from the SCID (average test–retest was 0.46) (Williams et al., 1992). As this was a pilot study, we used the SNAP-IV as our screening instrument for psychiatric symptoms. Further research is needed with the M-IED, coupled with more extensive diagnostic instruments, to establish the prevalence of IED and its related features in adolescents. Although IED is considered an impulse control disorder, it shares features with anxiety, mood and other chronic disruptive behavior disorders. Further clarifications of these issues would affect decisions on treatment. The small sample size and the high levels of psychopathology in this sample limit the generalizability of our findings. All psychiatric subjects were in residential placement under Child Protective Services custody. Both facilities were high level of care facilities where most children have histories of hard-to-manage behavior. We were, therefore, not surprised to find high levels of psychiatric symptomatology in all residential treatment subjects. The main difference between patients with IED symptomatology and controls was physical aggression, which is the core symptom according to DSM-IV criteria. These data do not support the expansion of IED criteria to include verbal aggression, as construct and discriminant validity diminished when it was included. However, the small sample size creates the possibility of type I error since the IED-R subjects displayed more episodes of physical aggression and verbal aggression, at approximately twice the frequency of psychiatric controls.

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