The Delinquency Interview for Children (DI-C): A self-report measure of antisocial behavior

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Abstract

A new self-report measure of antisocial behavior in childhood is presented. The Delinquency Interview for Children (DI-C) provides assessment in multiple domains of delinquent behavior, including Theft, Property Destruction, Violence, Truancy-related behaviors, and Minor Rule Violations. Both lifetime and recent (past year) scales are provided, along with measures of individual and co-offending with peers and siblings. Principal components analysis of the DI-C items in a sample of 401 boys and 404 girls (age 9-10 years old) suggested multiple dimensions underlying the items, warranting the formation of at least four or five subscales or item groupings. Psychometric analyses of the subscales indicate strong test-retest reliability over six month intervals, as well as moderate to high internal consistency within scales. Convergent validity was suggested by significant relationships between DI-C subscales and other published measures of externalizing behavior problems based on parent ratings, including the Child Behavior Checklist (CBCL) and the Diagnostic Interview Schedule for Children, (DISC-Version IV), as well as child self-reports of conduct disorder symptoms based on the DISC-IV.

Discriminant validity was suggested by the comparatively lower correlations of DI subscales with indicators of internalizing problems. Although girls and boys do not differ remarkably in their reports of types of delinquent behaviors in which they engage, boys do report more of these behaviors than girls at this age, both in lifetime and recent (past year) occurrence.
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The Delinquency Interview for Children: A self-report measure of antisocial behavior

Research on antisocial behavior in children has relied almost exclusively on measures obtained through parent or teacher reports (Hinshaw & Zupan, 1997). These reports are fallible, however, for several reasons. First, parents and teachers may not be aware of certain antisocial behaviors in which the child may engage. These may include covert antisocial behavior such as stealing and lying, which may not be observed by anyone, but may also involve overt behaviors, including bullying and relational forms of aggression, which are not observed by either the parent or teachers. Parents, for example, do not generally observe behaviors at school, while teachers do not observe antisocial behavior in the child’s home. Some overt antisocial behaviors may not always be observed by the adults who are asked to rate children in widely used instruments such as the Child Behavior Checklist (Achenbach, 1987).

A second source of error in parent and teacher reports of children’s antisocial behavior stems from the inability of these raters to know the true intentions and motivations of the child. Teachers or parents who are asked questions about reactive and proactive aggression (Raine & Dodge, 2003), for example, must make assumptions about the child’s level of frustration and intent to harm another child. Even when children are closely observed, these raters never have direct knowledge of the child’s thoughts and feelings, which are essential in determining the degree to which behaviors may be truly antisocial.

These various errors in ratings of children’s antisocial behavior by others may be some of the more important sources of disagreement among raters of the same child. It is well known that inter-rater correlations for children’s externalizing behavior problems are low to moderate at best, ranging from .2 (between parent and teacher ratings) to .3 (for two parents rating the same child) (Achenbach 1987). To the extent that children’s behavior varies across situations, opportunities for raters to observe certain behaviors will differ between raters, contributing to low agreement between raters. Parents and teachers also have different reference groups, to
Self-reported ASB in children which the child may be compared (e.g., siblings or a few peers in the neighborhood, vs. a larger group of peers at school). Given the myriad differences in school and home settings, it is no wonder that such low inter-rater agreement exists for measures of antisocial behavior.

Official records have also been used as indicators of behavior problems in children, including school discipline reports and juvenile justice records (Hinshaw & Zupan, 1997). These indicators, while perhaps having the advantage of greater criterion validity than parent and teacher rating scales, are not without measurement problems. There may be inconsistencies in recording various offenses, for example, depending on the legal and economic resources available to the child and his or her family. Perhaps most importantly, official records do not reveal “hidden” or “successful” antisocial behavior—i.e., offenses which are committed but not caught. It is critically important to obtain information about such undetected antisocial behaviors, since they may represent a non-trivial portion of an individual’s repertoire of deviance (Walker, 1995).

Given the problems inherent to parent and teacher ratings and official records of children’s antisocial behavior, obtaining information directly from the child would be extremely valuable in the assessment of his or her antisocial behavior. Self-report measures of antisocial behavior have, in fact, been used in research on adolescents and adults, and have proved to be a valid and reliable source of information in the areas of drug use, sexual behavior, violence, theft, and other illegal behaviors (Elliot & Huizenga, 1989; Loebber, Green, Lahey, & Stouthamer-Loeber, 1991; Moffitt, Silva, Lynam, & Henry, 1994; Rowe, 1983; Turner, Rogers, Lindberg, Pleck, & Sonenstein, 1998). Self-report methods have the advantage of detecting covert behaviors of which only the perpetrator may be aware, in addition to overt antisocial behaviors known to other reporters or available in official records. Moreover, children are developmentally ready to engage in self-evaluation of their feelings and motivations well before the onset of adolescence (Burton & Mitchell, 2003), and can provide valid reports of their own behaviors and personality.
Self-reported ASB in children characteristics (e.g., Luby, Svrakic, McCallum, Przybeck, & Cloninger, 1999). Child reports of antisocial behavior, in particular, have been shown to contribute unique and important information concerning their oppositional behavior (Angold & Costello, 1996). To this end, it is essential to understand the extent to which children’s self-report measures may add diagnostic utility in identifying externalizing behavior problems.

The lack of any published self-report instrument of antisocial behavior in children led us to develop such a measure, for use in a large-scale, comprehensive twin study of risk factors for antisocial behavior. In constructing this instrument, we considered three primary factors: (1) it should measure a wide variety of antisocial behaviors, so that different etiologies may be investigated for subtypes of offending; (2) it should include lifetime and recent offending, to aid in the distinction between individual children with life-course persistent behaviors and more transient groups who engage in antisocial behavior only during specific developmental periods; (3) for purposes of studying twins, it should distinguish between delinquent behaviors which involve co-offending with one’s co-twin and those that do not. The latter was considered important to help resolved the nature of sibling imitation effects found in twin studies, which may arise if twins engage in delinquent behaviors together (Carey, 1992; Rowe, 1983).

It is also important to distinguish among subtypes of antisocial behavior, so that different etiologies may be investigated. For example, studies of adults have shown genetic influences to be of greater importance for non-physical forms of law-breaking behavior (e.g., thievery and other property offenses) compared to violent crimes (e.g., murder and assault) (Mednick et al 1984). Since it is not yet clear whether such distinctions are important during childhood, it is important to measure these domains separately to address this question. Nonetheless, prior research on children and adolescents have highlighted the multidimensional nature of antisocial behavior, including meta-analyses of factor analytic studies suggesting important distinctions
between destructive and non-destructive behaviors, and between covert and overt behaviors (Frick, Lahey, Loeber, Tannenbaum, et al. 1993).

We present here the development of a Delinquency Interview for Children (DI-C), based on data from a large community sample of preadolescent boys and girls participating in the Southern California Twin Project. The DI-C assesses covert and overt antisocial behavior, including property offending, physical violence, theft, truancy, and other minor rule violations that pertain to this age group. We provide estimates of self-reported offending for children residing in a large, multicultural urban area. Sex differences, as well as co-twin and peer involvement in delinquent behaviors are also considered in our analyses of the DI-C. This paper, thus, provides the first detailed, published presentation and psychometric evaluation of a self-report measure of antisocial behavior for general use in children prior to adolescence (ages 9-10 years old). Publication of a standardized self-report instrument in this field of research, along with base rates of delinquent behaviors in a non-selected sample will provide the opportunity for future comparisons among different populations. In light of the well-established utility of self-report methods for assessing antisocial behaviors, combined with the known capabilities of children to provide self-evaluations of their own behaviors and motivations, a standardized self-report instrument of antisocial behavior in children would appear both useful and feasible.

Methods

Subjects. The present analyses are based on 805 children (49.8% male) and their primary caregivers (n=400 families) who have participated in the 1st wave of assessment in the USC Twin Study of Social and Moral Development (see Baker, Raine & Lozano, 2003). The sample is comprised of both male and female monozygotic (MZ) and dizygotic (DZ) pairs, including both same sex and opposite DZ twins, as well as five sets of triplets.

Twins and their families were ascertained primarily through local schools, both public and private, in Los Angeles and the surrounding communities—see Baker, Barton, & Raine (2002) for a
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detailed description of the recruitment process and twin register from which the twins were
sampled. Qualifications for study were based on age of the twins (9 or 10 years old at the time of
the 1st assessment), and their English proficiency (a stanine score of at least 3 on a standardized test
of English proficiency), and availability to participate in a 6-8 hour laboratory assessment at USC
on any day of the week. In addition, the twins’ primary caregiver was required to speak either
English or Spanish fluently. Twin interviews were conducted in English only, while caregiver
interviews were conducted in either English or Spanish. Caregivers were primarily comprised of
biological mothers (91.4%), although other relatives were also interviewed, including biological
fathers (6.1%), adoptive, foster or stepparents (1.3%), and grandparents (0.8%).

The mean age of the twin sample was 9.63 years (SD=0.58) at the time of the 1st assessment.
Children’s ethnicity was determined by the ethnicity of their two biological parents, as reported by
the primary caregiver. As such, the twin sample was comprised of 37.6% Hispanic, 25.9%
Caucasian, 12.6% Black, 3.9% Asian, 18.5% mixed and 1.6% other ethnicities. This ethnic
distribution is comparable to that in the general Los Angeles population, and therefore provides a
diverse community sample representative of a large urban area.

Individual analyses are based on 401 boys and 404 girls, including self-report from the
children (using the DI-C), as well as caregiver reports (using published measures of externalizing
and internalizing behavior problems). Analyses involving teacher reports are based on a subsample
of these children (242 boys and 230 girls) for whom completed teacher questionnaires were
received. A subset (n=24 families) of the full sample also participated in a repeated assessment four
to six months following their original laboratory visit—the retest sample included 19 boys and 29
girls, for whom test-retest correlations were computed. The breakdown of twin pairs by sex and
zygosity is as follows: 90 MZ male, 95 MZ female, 59 DZ male, 58 DZ female, and 98 DZ male-
female pairs.
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Measures. Several measures of aggression and delinquency are included in our evaluation of the newly developed Delinquency Interview for Children. These were collected as part of the ongoing longitudinal study of risk factors for antisocial behavior (MH-58354) at the University of Southern California.

The Delinquency Interview for Children (DI-C) was developed as a self-report measure of antisocial behavior suitable for 9-10 year old male and female children from diverse ethnic backgrounds. This instrument was adapted from several existing measures, including the Self-Report Delinquency in Adolescence (SRA) from the Pittsburgh Youth Study (Loeber & Farrington, 1998), which was in turn developed from Elliott's self-report delinquency interview in the National Longitudinal Survey (Elliot & Huizenga, 1989). The DI-C includes questions concerning 64 different delinquent behaviors at home and school in four categories: (1) general misconduct (17 items concerning truancy, lying, and minor rule violations); (2) property damage (15 items concerning vandalism, graffiti, arson); (3) thievery (17 items concerning shoplifting; stealing money and other items from family, friends, and others; obtaining goods and services without paying); and (4) physical aggression (violence against siblings and other children outside the family, with 15 parallel items in each category). An interview format was used to administer the DI-C in this study, in order to avoid problems associated with poor reading skills in some children. A self-report questionnaire format for the DI-C is also available, both in computerized and paper-and-pencil forms. Given the comorbidity of reading disabilities and conduct problems in children (Gilger, Pennington, & DeFries, 1992; McGee, Share, Moffitt, Williams, & Silva, 1998), we deemed the interview format to be essential so that children with greatest amounts of delinquency would not be overlooked due to reading deficits.

Children are asked first about whether or not they have ever done various behaviors in each of the four categories. For any item endorsed, the child is then asked how often each behavior occurred during past year. Individual items for these behaviors are listed in Table 1, along with
Self-reported ASB in children percentages of boys and girls endorsing each item in their lifetime ("ever") and recently ("past year").

Additional follow-up questions for each item endorsed include queries about how often a friend was present when these behaviors were done during the past year. Since the DI-C was developed in the context of a twin study, children are also asked questions about how often their twin was present for the individual behaviors endorsed in the past year. Following each of the four categories of questions, the child is asked how often it was their own idea or their twin's idea to do the various behaviors. Thus, the DI-C provides several subscales of antisocial behavior for various domains of offending, including both lifetime and recent (past year) estimates for each domain. The additional queries about co-offending with a sibling or peer allow the distinction to be made between individual, partner, and group offending.

*The Child Behavior Checklist (CBCL).* The 112-item behavior checklist from the CBCL (Achenbach & Edelbrock, 1981) was administered to the mothers in interview form. The original response choices were retained in this study, such that each item is scored on a three-point scale: 0 (Never), 1 (Sometimes) and 2 (Often). Among the eight sub-scales derived from these items, the present analyses include only three (Attention Problems, Delinquent Behavior, and Aggressive Behavior). In addition, the two higher order factors of Internalizing and Externalizing problems were used to evaluate convergent and discriminant validity of the DI-C subscales.

The teacher report form of the CBCL (CBCL-TRF) was also obtained for children participating in this study. The same three subscales and two higher order factors were used in additional validity analyses using teacher reports.

*The Diagnostic Interview Schedule for Children, Version IV (DISC-IV)* is a highly structured interview designed to assess DSM-IV psychiatric disorders and symptoms in children and adolescents aged 6 to 17 years (Shaffer, Fisher, Dulcan, Davies, Piacentini, Schwab-Stone,
Self-reported ASB in children (Lahey, Bourdon, Jensen, Bird, Canino, Regier, 1996). The DISC was designed to be given by lay interviewers for epidemiological research. It has a youth version, as well as a parallel parent version, both of which ask about the child’s psychiatric symptoms. In the present study, only the Conduct Disorder module in the DISC-Youth was administered to the children, while modules from the DISC-Parent included Conduct Disorder, Oppositional Defiant Disorder, Attention-Deficit Disorder, Generalized Anxiety Disorder, and Major Depression/Dysthymic Disorder. Both symptom counts and clinical diagnoses are considered in the present analyses.

Results

Item analyses and dimensionality. Principal component analyses of the 64 items were used initially to evaluate the dimensions underlying childhood antisocial behavior. These were performed separately for boys and girls. The eigenvalues characterizing the covariance matrix for all 68 items indicated a modest amount of item variance being accounted by the first principal component (15.04% in boys; 16.49% in girls). Scree plots of the eigenvalues, however, suggested the importance of additional factors underlying these items (see Figures 1a and 1b for boys and girls, respectively). That is, these self-reported antisocial behaviors for 9-10 year old children appear multidimensional, with as many as three to five different factors appearing justifiable on the basis of the inflection points of the scree plots in Figures 1a and 1b.

In an examination of the rotated factor loadings in multiple factor solutions for the present study of 9-10 year old children, the first factor was consistently comprised of overt items concerning physical aggression and violence, both for boys and girls. Subsequent factors reflected covert antisocial behaviors, including theft and other forms of deception (lying to teachers and parents about one’s whereabouts or activities), as well as items concerning property destruction, many of which may be done without detection (e.g., graffiti or purposefully damaging items belonging to another person). Beyond the first factor reflecting overt physical aggression, however, the additional factors did not clearly distinguish among types of non-
Self-reported ASB in children physical antisocial behaviors. For example, items concerning theft, property destruction, and truancy did not clearly separate onto different factors.

**Item groupings.** In light of the apparent multifactorial nature of the DI-C items, in combination with prior research suggesting the importance of several categories of antisocial behavior, additional analyses were performed for groups of items representing different types of antisocial behavior. These included physical aggression and violence, theft, property damage, and general misconduct. The latter group of items included various rule-violations, ranging from watching TV without permission to school truancy. Violence items were further categorized into those based on aggression towards the co-twin, another sibling, or another child outside the family. These analyses included principal components and reliability analyses of items within each category to explore their dimensionality and evaluate internal consistency for scales based on combinations of these items. Separate results were examined for boys and girls, and comparisons were made to evaluate differences in scale properties.

Principal components analyses (PCA) of the various items groups clearly suggested unidimensionality for the violence items within each category (against one's twin, another sibling, a non-sibling peer, or any child), based on scree plots of eigenvalues and strength of loadings (all values > 0.40) on the first principal component. Moreover, PCA of the physical aggression items yielded striking similarities for boys and girls, both in terms of the apparent unidimensionality, as well as in the general order of factor loadings within each item group (i.e., based on the nature of the victim).

The general misconduct items, however, appeared to be characterized by two factors in both boys and girls. Rotated two-factor solutions suggested groupings of (1) truancy ("skipping school without parent's permission") and truancy-related items concerning unauthorized movement or whereabouts of the child (e.g., "sneaking out of the house without permission"; "running away from home overnight"; "hitchhiking") and (2) minor rule-violations (e.g.,
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"watching TV when you’re not supposed to”; “prank phone calls”; “copying someone else’s homework”; and “cheating on a test”). Further consideration of these items was made using separate as well as combined groupings of the rule-violation and truancy-related items.

PCA analyses of the property damage items also suggested the possibility of multidimensionality in both boys and girls, although there was no clear separation of items into meaningful groups. Among the highest loading items on the first principal component for boys and girls were: “Scratching a car with a sharp object”; “Ripping or scribbling on important papers belonging to someone else”, “Smashing or breaking a toy”, “Throwing eggs, rocks, or other things at cars or someone’s house”; “Writing on a desk”; and “Writing graffiti somewhere else”. During the interview, it was emphasized to the child that they should only endorse these items when they were done on purpose, with the intention of destruction. If a child indicated accidentally breaking a toy or window, it was explained to the child that these did not count as purposeful property damage and the items were not counted as being endorsed. Given the lack of clear subgroupings of property damage items, these behaviors were considered together in further scale development.

Items concerning theft appeared more one-dimensional, based on scree plots and strength of factor loadings in both boys and girls. Highest loading items on the first principal component in boys and girls included “Taking candy or food from a store without paying”; “Taking money from someone’s backpack, purse, wallet, or drawer”; “Keeping another kid’s toy (or pen or eraser) without their permission”; and “Taking something else that did not belong to you”. Additional items concerning the value of items stolen were also included in the DI-C. Among the children who reported having ever stolen anything, the majority (84.2%) indicates the value to be less than $5. A small number of children (n=5) reported having stolen items worth $50 or more in value at some point in their lifetime. Although the majority of theft items may reflect taking items of trivial value, there are a significant number of children who report engaging in
Self-reported ASB in children more serious theft of items (exceeding $50 in value). While these five children correspond to 3.2% of the children who reported stealing something at least once in their lifetime, they are only .6% of the total sample.

**Item endorsement.** The extent of item endorsement for lifetime ("ever done") in the various categories of antisocial behavior is summarized in the Appendix, separately for boys and girls. Items are ordered within each category according to the frequency of endorsement in boys, from most (top) to least (bottom). Among the non-aggressive items, those concerning general misconduct (especially the minor rule violations) were generally among the more frequently endorsed (e.g., over 1/3 of both boys and girls report watching TV when they are not supposed to), while fewer children endorsed property damage, thievery, and truancy-related items.

Physically aggressive behaviors were endorsed quite frequently both by boys and girls. It should be noted, however, that these items reflect physical aggression against any other child, including a twin, another sibling, or a non-sibling peer. When asked separately about aggression against non-siblings, fewer children generally endorsed these items compared to the general items that did not specify the victim. Nonetheless, items concerning physical aggression against children outside the family were still endorsed with considerably greater frequency than theft, property damage, and truancy-related items.

It is noteworthy that a greater percentage of boys endorse some, but not all, items in every category compared to girls. Although the percentage of children endorsing each item is greater in absolute value for boys for 47 items, sex differences are only statistically significant for 13 of the 65 items in total (p < 0.05 for Fisher’s exact test, one-tailed). At least for this range of self-reported antisocial behaviors, 9-10 year girls were not markedly different from boys in their engagement in various rule-breaking, aggressive, and other deviant behaviors at least once in their lifetime.
Subscale development. Internal consistency of the items was examined within each category of offending, separately for boys and girls, as shown in Table 1. Cronbach's alpha was particularly good for the "violence" items reflecting physical aggression (> .80 for both boys and girls), as well as for the total set of items (.89 for boys; .90 for girls). Internal consistency for the Truancy-related, Minor Rule-violation, Property Damage and Theft items was only modest in comparison to the aggression items, most likely due to both the relative infrequency and variability of item endorsement.

Subscales were formed for various types of delinquent behavior, by counting the number of items ("ever done") endorsed within each category. A DI Total was also computed as the sum of all items endorsed. Test-retest correlations (also in Table 1) are moderate to high and highly significant for all subscales, with the exception of Truancy-related items in girls. Thus, the scales generally demonstrate good test-retest reliability over a six-month period.

The proportion of "ever done" items endorsed within each category of antisocial behavior was computed for each child. The average proportions are summarized in Figure 2a (for non-aggressive subscales) and Figure 2b (for aggressive subscales), separately for boys and girls. The highest levels of endorsement were seen for Minor Rule-violation and Twin Violence, both for boys and girls, while serious types of offending such as Theft, Property Damage, and Non-sibling Violence items were endorsed less frequently. As expected, boys endorsed greater proportions of items for all categories except violence against a non-twin sibling, with significant sex differences for minor rule-violation (t=2.13, df=798, p<.05), property damage (t=2.469, df=798, p<.05), twin violence (t=2.472, df=1,672, p<.05), and non-sibling violence (t=3.887, df=674, p<.01) and theft (t=2.035, df=798, p<.05). Sex differences were not significant for the remaining scales (proportion of items for truancy-related behaviors, violence against a non-twin sibling, and animal violence).
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Recent ("past year") offending. The patterns of results for "past year" items and subscales were remarkably similar to those for lifetime ("ever") offending, with respect to factor loadings, internal consistency, test-retest reliability, and average sex-differences. As expected, average proportions of item endorsement were somewhat lower than for lifetime, however, in all categories (see Figures 3a and 3b for non-aggressive and aggressive subscales, respectively).

Validity of DI subscales. Several analyses were conducted to evaluate the construct validity of the DI scales. Convergent validity was evident first through the correlations of the all DI subscales and the DI-Total with subscales in the CBCL, using both caregiver and teacher ratings. Table 2 shows significant correlations (p < .05) of the DI subscales with both Delinquency and Aggression subscales, as well as the overall Externalizing behavior problems factor. These correlations are significant for both caregiver and teacher ratings in every case, and are comparable for caregiver and teacher reports. It is noteworthy that the DI Theft subscale shows the strongest relationship to the CBCL subscales, both for teacher and caregiver reports of Aggression and Delinquency.

A comparison of children with and without Conduct Disorder (CD) was made as a further test of convergent validity of the DI subscales. CD diagnoses were obtained through the DISC, using both parent and youth report versions. These included 18/402 (4.5%) boys and 7/405 (1.7%) girls who received a CD diagnosis from either the parent or youth report. All scales were significantly different between the CD and non-CD groups (p < .05 based on t-tests for groups with heterogeneity of variance), such that CD children reported higher levels of truancy, minor-rule breaking, property damage, theft, and violence towards siblings, non-siblings, and animals. The pattern of differences between CD and non-CD children is graphically depicted for non-aggressive (see Figure 4a) and aggressive (see Figure 4b) subscales in the DI.
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Comparing DI subscales between groups of children with low and high ratings on CBCL scales of Delinquency and Aggression were made as further evaluation of convergent validity in the DI. Based on caregiver CBCL scores, children with high Delinquency scores (>70) reported significantly more Minor Rule Breaking (t=2.12, df=18.52, p<.02), Theft (t=2.80, df=18.17, p<.01), and Sibling violence (t=1.95, df=17.06, p<.05). Group differences were marginally significant for Truancy-related items (t=1.50, p<.10), Property Damage (t=1.44, df=18.71, p<.10) and Non-sibling violence (t=1.60, df=17.58, p<.10). See Figures 5a and 5b for a graphic presentation of the DI scale differences between children rated by their parents to have high versus low CBCL Delinquency scores.

Next, comparing groups of children on the basis of their caregiver-rated CBCL Aggression ratings, those with high scores (>70) reported significantly more Theft (t=2.64, df=559, p<.05), as well as greater Sibling violence (t=2.69, df=312, p<.05) and Non-sibling violence (t=2.23, df=416, p<.05). Marginally significant (p < .10) group differences were also found for Truancy, Minor Rule Breaking, and Property Damage (see Figures 6a and 6b for non-aggressive and aggressive DI scales, respectively).

Discriminant validity was also investigated for the DI subscales, through comparisons of the various subscales relationships with internalizing and externalizing behavior problems. Table 3 presents correlations among DI subscales and various DISC symptom counts, including Conduct Disorder (CD), Oppositional Defiant Disorder (ODD), Attention Deficit Hyperactivity Disorder (ADHD), Major Depressive Disorder (MDD), and Generalized Anxiety Disorder (GAD). CD symptom counts are available from both the youth and caregiver reports, while the other childhood disorders are rated only the caregiver. As expected, there are significant correlations of the DI subscales with all three externalizing disorders—CD, ODD, and ADHD. The correlations are notably higher between self-reported delinquent behaviors in the DI with youth reported CD symptoms, suggesting a possible rater effect.
Although the strongest associations in Table 3 exist between the DI-C and externalizing disorders (ODD and CD), there are a few noteworthy relationships of DI-C subscales with internalizing disorders. In particular, the Truancy-related scale correlates with both depression (MDD) and anxiety (GAD) symptoms. In addition to missing school without a parent’s permission, it should be noted that the Truancy-related items also include various behaviors involving lying to a parent or teacher about one’s whereabouts (running away from home; taking a ride from a stranger). Theft is also associated with MDD symptoms; thus, in addition to being indicative of defiance associated with externalizing problems, the deceptive behaviors of theft and truancy could possibly stem from internalizing problems such as depression and/or anxiety.

We also examined relationships of DI scales with both internalizing and externalizing behavior problems using the caregiver and teacher CBCL ratings (see Table 4). All DI scales except Animal violence were significantly related (p<0.05) to CBCL Externalizing based on caregiver ratings. For teacher ratings, CBCL Externalizing correlated significantly (p<0.05) with three of the four non-aggressive DI scales. The lack of correlation with Property Damage may be due to the fact that these may be more covert behaviors not observed by teachers at school, at least at this early age. Among the DI aggressive scales, only Non-Sibling violence correlated significantly with teachers’ CBCL Externalizing (r=0.22, p<0.05), perhaps indicating that the other forms of twin and sibling aggression (which may not be observed by teachers) may be distinct from aggression towards children outside of one’s family.

Although discriminant validity of the DI-C is still apparent based on its relationship to the CBCL, the differences between DI-C correlations with externalizing and internalizing problems is less accentuated in the CBCL compared to the DISC-IV. It is again interesting to note that several DI scales correlate with CBCL internalizing problems, both for teacher and caregiver ratings. These may reflect the lack of independence of internalizing and externalizing behaviors, as has been noted (Achenbach, 1991). We also note the lack of correlation between the
Self-reported ASB in children aggressive DI scales with CBCL Internalizing ratings by caregivers, although this correlation does exist for CBCL teachers’ ratings.

Overall, the construct validity of the DI-C appears reasonably high, based on both its convergence with well-established measures of externalizing problems and its ability to discriminate antisocial behavior and aggression from other childhood behavior problems of an internalizing form.

Co-offending. Children were also asked about the extent to which each delinquent behavior in the past year involved their co-twin or another peer. For any given item endorsed for the “Have you ever?” query, the child was subsequently asked “How many times did you do this in the past year”, “How many times was your twin with you when you did this?” and “How many times was a friend with you?” The proportion of co-offending with one’s twin and other friends could thus be computed for each category of items. For co-offending with one’s twin, these proportions varied somewhat over category (see Figures 7a-h). As shown, the percentage of children who report that their co-twin was never involved in their delinquent behaviors (i.e., shaded area for 0% in Figures 7a-h) was largest for Property Damage items and smallest for Minor Rule Violations. That is, children report engaging in Property Damage more often without their twin, while Minor Rule Violations apparently occur in tandem for the two twins rather than individually. In fact, over 1/2 of the girls and 1/3 of boys report co-offending with one’s twin at least 75% of the time for Minor Rule Violations. Contrary to this, about ½ of the Property Damage and Theft behaviors are reported as individual behaviors, without involvement of one’s twin.

Co-offending with friends appears to be less frequent than co-offending with one’s twin (see Figures 8a-h) for all categories of delinquent behaviors reported in the DI. For every category, at least half of the offenses are reported to occur without the presence of a friend, such that the majority of behaviors are reported as not involving a friend.
It should be noted that children were not asked about the frequency of delinquent behaviors in which he or she engaged alone (i.e., without either the twin or a friend), or the number of times that both a friend and the twin was involved together. That is, the co-offending queries about twin and peer were made separately, such that this additional information about individual behaviors and joint involvement of twin and other peers could not be determined. Nonetheless, it was possible to derive separate subscales indicating the extent to which the cotwin was and was not involved in the child’s delinquent behaviors in the past year. These scales will be of particular interest in genetic analyses, in order to examine whether sibling imitation effects would appear for behaviors with and without the twin’s involvement.

Discussion

Based on our analyses of the newly developed Delinquency Interview for Children (DI-C), we conclude that self-report methods can be used successfully to assess antisocial behavior in preadolescent children. Children’s self-reported aggression and delinquency in the DI-C correlates significantly with both parent and teacher reports of these behaviors, demonstrating good convergent validity with established measures in this area. Discriminant validity is also suggested by comparatively lower or negligible correlations of the DI-C with parent and teacher ratings of internalizing childhood problem behaviors. Thus, the DI-C appears to measure specific externalizing problem behaviors, including physical aggression and rule violations, rather than global problem behaviors or psychopathology.

There are particularly strong relationships of the DI-C subscales with children’s self-reported symptoms of conduct disorder (i.e., as measured in the DISC-IV youth version). The DI-C could potentially be used as an alternative self-report measure of conduct problems, particularly when trained DISC examiners are not readily available for a given study. The DI-C can be easily administered in either questionnaire or interview format to children as young as 9 years old. Although the DI-C does not provide diagnoses of conduct disorder, it does provide
Self-reported ASB in children quantitative indicators in all areas of CD symptoms, including aggression against animals and people (with distinctions among sibling and non-sibling victims), destruction of property, deceitfulness or theft, and serious rule violation. One advantage of the DI-C is that it also provides quantitative indicators of a broader range of antisocial behaviors, such as minor rule breaking.

Children’s responses to the DI-C provide evidence for several dimensions underlying antisocial behavior prior to adolescence. There is a clear distinction between covert and overt behaviors, which are already apparent as early as 9-10 years old. Additional distinctions are also evident for physical aggression and violence, according to whether the victim is a sibling or another child outside the family. The multiple factor structure of antisocial behavior in these data is consistent with previous reports that highlight the distinction of overt and covert forms of deviant behavior among children and adolescents (Frick et al. 1993). It is somewhat surprising that both the CBCL Aggression and Delinquency scales appear related to both aggressive and non-aggressive subscales of the DI. Thus, while overt and covert behaviors emerge as separate factors in our analyses of the DI, the distinctions of aggressive and non-aggressive antisocial behavior in these pre-adolescent children are not as clear, at least as measured by the DI-C and CBCL subscales.

The various subscales for Theft, Property Damage, Violence, and General Misconduct each show good test-retest reliability over six months, indicating considerable short-term stability in antisocial behaviors self-reported by 9-10 year old children. Internal consistency varied across subscales, with the lowest values for scales reflecting more covert behaviors. The fact that many of these behaviors occur with quite low frequencies, however, most certainly contributes to the modest alpha coefficients for these scales. Internal consistency, on the other hand, was particularly good for scales reflecting more overt (physically aggressive) behaviors.
Self-reported ASB in children

The DI appears to work equally well in measuring delinquent behaviors in boys and girls. There is remarkably high correspondence in the factorial composition of the DI items for boys and girls, including high congruence between the sexes for factor loadings within categories. At the item level, some items (a minority, in fact) were endorsed more frequently by boys, and even these were not markedly different between the sexes. Nor were overall scale distributions (proportion of items endorsed) markedly different for number of different items. Somewhat greater sex differences were apparent, however, when considering frequency of occurrence of behaviors, as expected. Thus, boys and girls appear to engage in the same varieties of delinquent behaviors at this age, although boys may engage in them more frequently. The magnitude of these differences may also increase throughout adolescence, as suggested by other studies of self-reported antisocial behavior (Moffitt, Caspi, Rutter, & Silva, 2001). The extent to which sex differences in offending may increase with age will be evaluated during future follow-up assessments of the present study cohort.

Degree of co-offending with twin and peers is already substantial at this early age. It will be interesting to investigate the co-offending scales in greater depth in future genetic analyses. Given the strong effects of sibling imitation found in twin studies of aggressive and antisocial behavior (Carey, 1992), it is important to understand the degree to which such effects may be due to co-offending between twins. Separate scales reflecting antisocial behavior with and without one’s twin may be analyzed separately to determine the extent to which sibling imitation effects in behavior genetic models of antisocial behavior may be a function of twins being “partners in crime”.

The primary limitation in the present study is the lack of an indisputable external validity measure of antisocial behavior, such as official records of delinquency from the schools or juvenile courts. At the same time, such external measures alone suffer from the limitation of encapsulating only caught, or “failed” delinquents. Thus, the DI-C has the potential to tap into
Self-reported ASB in children hidden offenses, as a means of studying "successful" delinquents whose offending may go undetected by official sources. It should also be noted that the present twin study is a longitudinal one, in which follow-up assessments of this cohort include requests for official school records. As the children progress through adolescence and young adulthood, and hence the high risk period for juvenile offending, future follow-up investigations will provide the opportunity to evaluate external validity to a much greater extent. Nonetheless, correlations of the DI-C subscales with concurrent teacher reports of externalizing problems are suggestive of external validity. It remains to be seen whether the DI-C scales at age 9-10 will predict serious delinquency at later ages, whether measured by future official records or self-report indices.

In conclusion, the DI-C appears to be a reliable and valid instrument for obtaining self-reported antisocial behavior in children. It may be used in community samples or clinical settings, using a questionnaire or interview format. As in other areas of psychopathology, the most reliable and effective assessment of antisocial behavior in children most likely involves multiple informants. Used in combination with teacher and parent reports, the DI-C could be of considerable importance in areas of treatment and intervention, in that it would aid in identifying problem behavior at an early age.

Acknowledgements

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Literature Cited


<table>
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<th>Violence Type</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>p-value</th>
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<tr>
<td>Any violence</td>
<td>15</td>
<td>1</td>
<td>0.06</td>
<td>0.73</td>
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<td>15</td>
<td>1</td>
<td>0.06</td>
<td>0.73</td>
</tr>
<tr>
<td>Sibling violence</td>
<td>15</td>
<td>1</td>
<td>0.06</td>
<td>0.73</td>
</tr>
<tr>
<td>Other violence</td>
<td>15</td>
<td>1</td>
<td>0.06</td>
<td>0.73</td>
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*Internal consistency values calculated on total sample (n=491 boys; n=494 girls). Test-retest correlations based on restricted subsample (n=19 boys; n=20 girls).

*Significant test-retest correlation (p<0.05)

**Marginally significant test-retest correlation (p<0.10)
Table 1

Reliability of the DI-C: Internal consistency (α) and six-month test-retest correlations (r) for lifetime ("ever done") subscales

<table>
<thead>
<tr>
<th>Scale</th>
<th>n items</th>
<th>Boys&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Girls&lt;sup&gt;a&lt;/sup&gt;</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>α</td>
<td>r</td>
</tr>
<tr>
<td>DI Total</td>
<td>64</td>
<td>0.89</td>
<td>0.67*</td>
</tr>
<tr>
<td>General misconduct</td>
<td>17</td>
<td>0.71</td>
<td>0.80*</td>
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<tr>
<td>Truancy-related</td>
<td>9</td>
<td>0.61</td>
<td>0.77*</td>
</tr>
<tr>
<td>Minor Rule Violation</td>
<td>8</td>
<td>0.63</td>
<td>0.78*</td>
</tr>
<tr>
<td>Property Damage</td>
<td>15</td>
<td>0.55</td>
<td>0.74*</td>
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<tr>
<td>Theft</td>
<td>17</td>
<td>0.66</td>
<td>0.83*</td>
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<tr>
<td>Any violence</td>
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<td>0.81</td>
<td>0.46*</td>
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<tr>
<td>Twin violence</td>
<td>15</td>
<td>0.77</td>
<td>0.54*</td>
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<tr>
<td>Sibling violence</td>
<td>15</td>
<td>0.70</td>
<td>0.61*</td>
</tr>
<tr>
<td>Other violence</td>
<td>15</td>
<td>0.79</td>
<td>0.59*</td>
</tr>
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</table>

<sup>a</sup>Internal consistency values calculated on full sample (n= 401 boys; n= 404 girls). Test-retest correlations based on retested sub-sample (n= 19 boys; n= 29 girls).

<sup>*</sup>Significant test-retest correlation (p<0.05)

<sup>m</sup>Marginally significant test-retest correlation (p<0.10)
Table 2

Correlations between DI and CBCL subscales

<table>
<thead>
<tr>
<th>DI Subscale</th>
<th>Delinquency</th>
<th>Aggression</th>
<th>Externalizing</th>
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<tr>
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<td><strong>Lifetime offending</strong></td>
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<tr>
<td>Truancy-related</td>
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<td>0.18*</td>
<td>0.10*</td>
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<tr>
<td>Minor Rule Breaking</td>
<td>0.13*</td>
<td>0.18*</td>
<td>0.12*</td>
</tr>
<tr>
<td>Property Damage</td>
<td>0.12*</td>
<td>0.15*</td>
<td>0.13*</td>
</tr>
<tr>
<td>Theft</td>
<td>0.27*</td>
<td>0.28*</td>
<td>0.23*</td>
</tr>
<tr>
<td>Non-sibling Violence</td>
<td>0.18*</td>
<td>0.19*</td>
<td>0.19*</td>
</tr>
<tr>
<td>Total</td>
<td>0.19*</td>
<td>0.19*</td>
<td>0.20*</td>
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<tr>
<td><strong>Past year offending</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Truancy-related</td>
<td>0.17*</td>
<td>0.23*</td>
<td>0.12*</td>
</tr>
<tr>
<td>Minor Rule Breaking</td>
<td>0.14*</td>
<td>0.17*</td>
<td>0.11*</td>
</tr>
<tr>
<td>Property Damage</td>
<td>0.13*</td>
<td>0.16*</td>
<td>0.13*</td>
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<tr>
<td>Theft</td>
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<td>0.22*</td>
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<tr>
<td>Non-sibling Violence</td>
<td>0.16*</td>
<td>0.16*</td>
<td>0.17*</td>
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<tr>
<td>Total</td>
<td>0.20*</td>
<td>0.19*</td>
<td>0.19*</td>
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* p < .05
** p < .01
Table 3

Correlations Between DI scales and DISC Symptom Counts

<table>
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<tr>
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<th>Youth Report</th>
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<tbody>
<tr>
<td></td>
<td>CD</td>
<td>CD</td>
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<tr>
<td>Truancy-Related</td>
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<td>0.21**</td>
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<td>Minor Rule-Violation</td>
<td>0.51**</td>
<td>0.20**</td>
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<tr>
<td>Property Damage</td>
<td>0.61**</td>
<td>0.12**</td>
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<tr>
<td>Theft</td>
<td>0.71**</td>
<td>0.28**</td>
</tr>
<tr>
<td>Any Violence</td>
<td>0.51**</td>
<td>0.10*</td>
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<tr>
<td>Twin Violence</td>
<td>0.43**</td>
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<td>Nonsibling Violence</td>
<td>0.64**</td>
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</tr>
<tr>
<td>Animal Violence</td>
<td>0.34**</td>
<td>0.12**</td>
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*p < .05

**p < .01
Table 4

Correlations of DI with CBCL internalizing and externalizing scales

<table>
<thead>
<tr>
<th></th>
<th>CBCL Externalizing</th>
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<tr>
<td></td>
<td>Caregiver Ratings</td>
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<tr>
<td></td>
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<tr>
<td>Truancy</td>
<td>0.13**</td>
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<td>Minor Rule Breaking</td>
<td>0.13**</td>
<td>0.16**</td>
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<tr>
<td>Property Damage</td>
<td>0.09*</td>
<td>0.04</td>
</tr>
<tr>
<td>Theft</td>
<td>0.22**</td>
<td>0.22**</td>
</tr>
<tr>
<td>Twin Violence</td>
<td>0.11**</td>
<td>0.06</td>
</tr>
<tr>
<td>Sibling Violence</td>
<td>0.12**</td>
<td>0.12</td>
</tr>
<tr>
<td>Non-Sib Violence</td>
<td>0.16**</td>
<td>0.22**</td>
</tr>
<tr>
<td>Animal Violence</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>314 - 560</td>
<td>177 - 290</td>
</tr>
<tr>
<td></td>
<td>314 - 560</td>
<td>177 - 290</td>
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N (range)

* p < .05
** p < .01
Figure 1a: Scree Plot of Eigenvalues for DI-C items (Boys)

Component Number

Figure 1b: Scree Plot of Eigenvalues for DI-C items (Girls)

Component Number
Self-reported ASB in children

Figure 2a: Proportion of "ever" items endorsed:

Non-aggressive scales

- Minor rule violation
- Truancy-related
- Property Damage
- Theft

Figure 2b: Proportion of "ever" items endorsed:

Aggressive scales

- Twin violence
- Other sib violence
- Non-sib violence
- Animal violence
Figure 3a: Proportion of "past year" items endorsed: Non-aggressive scales

Figure 3b: Proportion of "past year" items endorsed: Aggressive scales
Figure 4a. DI comparison for children with and without CD: Non-aggressive DI subscales

Figure 4b. DI comparison for children with and without CD: Aggressive DI subscales
Figure 5a: Comparison of CBCL Delinquency groups: Non-aggressive DI subscales

Figure 5b. Comparison of CBCL Delinquency groups: Aggressive DI subscales
Figure 6a: Comparison of CBCL Aggression groups: Non-aggressive DI subscales

Figure 6b: Comparison of CBCL Aggression groups: Aggressive DI subscales
Self-reported ASB in children

Figures 7a-d

Co-offending with Twin (Truancy)

Boys

Girls

Co-offending with Twin (Truancy-Related)

Boys

Girls

Co-offending with Twin (Minor Rule)

Boys

Girls

Co-offending with Twin (Minor Rule)
Figures 7e-h

Self-reported ASB in children

Co-offending with Twin (Property Damage)

Boys

Girls

Co-offending with Twin (Theft)

Boys

Boys
Figures 8a-d

Co-offending with Friends (Truancy)

Boys

Girls

Co-offending with Friends (Minor Rule)

Boys

Girls

Self-reported ASB in children
Figures 8e-h

Co-offending with Friends (Property Damage)

Boys

Girls

Co-offending with Friends (Theft)

Boys

Girls

Self-reported ASB in children
Appendix

Self-reported ASB in children

Delinquency Interview for Children:
General misconduct item frequencies (Ever)

12 Watch TV when you weren't supposed to?
3 Sneak out of bed to watch TV at night when you were not supposed to?
13 Watch movies you weren't allowed to see?
15 Copy someone's homework?
16 Cheat on a test?
11 Make prank phone calls?
17 Sign your parent's name to something (like a report card)?
14 Look at Web pages you weren't supposed to?

Delinquency Interview for Children:
Truancy item frequencies (Ever)

4 Skip school without telling your parents?
7 Run away from home overnight?
10 Hitchike or take a ride from a stranger?
5 Leave school without telling anyone, when you weren't supposed to leave?
6 Run away from home during the day?
2 Sneak out of the house when you were not supposed to leave?
9 Lie to a teacher about where you were going while you were at school?
1 Did you ever ride your bike away from home when you were not suppose to, or without telling anyone?
8 Lie to your parents about where you were going or who you would be with?
Self-reported ASB in children

Delinquency Interview for Children:
Theft item frequencies (Ever)

- 40. Take someone's lunch at school?
- 39. Take a toy from a friend without asking?
- 41. Keep extra change when you knew you were given too much by the cashier?
- 42. Take another kid's bicycle, skateboard or skates?
- 43. Did you ever take candy or food from a store without paying?
- 44. Go into someone's house or yard when they weren't home to try to take something?
- 45. Find something valuable and not try to return it?
- 46. Take something else that did not belong to you?
- 47. Did you ever sneak into the movies?
- 48. Get free food when you were supposed to pay for it?
- 49. Sneak onto the bus, metro or train without paying?
- 50. Steal something that did not belong to you!

Delinquency Interview for Children:
Property damage item frequencies (Ever)

- 23. Write on a car?
- 26. Scratch a car with a sharp object, like a knife or a key?
- 29. Rip up or scribble on a book or important papers that belonged to someone else?
- 30. Set a fire without permission?
- 31. Smash or break a toy that belonged to someone else?
- 28. Cut up seats in a car or bus?
- 24. Write graffiti somewhere else?
- 21. Write on a bathroom wall or door?
- 32. Throw eggs, rocks, or other things at cars or someone's house?
- 27. Hit a car with a baseball bat or some other hard object?
- 33. Tee Pee (toilet paper) someone's house?
- 18. Did you ever break a window of a building?
- 25. Carve something into a desk, for example, with a pen or a knife?
Delinquency Interview for Children:
Physical aggression item frequencies (Ever)

A5 Kicked someone?
A14 Pulled someone's hair?
A8 Tried to trip someone or make them fall on purpose?
A11 Screamed or yelled really loud in someone's ear?
A9 Scratched someone on purpose?
A2 Shoved another kid?
A3 Hit or fought someone where it caused bruises or bleeding?
A10 Pinched or squeezed someone hard enough to hurt them?
A6 Hit someone with a hard object like a toy or a book?
A1 Have you ever hit, slapped or punched another kid?
A4 Bit someone?
A13 Stepped on someone's hand or foot on purpose?
A12 Thrown food or water at another person to hurt or tease them
A7 Threw rocks or a hard object at someone?
A15 Tore another kid's clothing?

Delinquency Interview for Children:
Physical aggression against non-sibling (Ever)

A5 Kicked someone?
A14 Pulled someone's hair?
A8 Tried to trip someone or make them fall on purpose?
A11 Screamed or yelled really loud in someone's ear?
A9 Scratched someone on purpose?
A2 Shoved another kid?
A3 Hit or fought someone where it caused bruises or bleeding?
A10 Pinched or squeezed someone hard enough to hurt them?
A6 Hit someone with a hard object like a toy or a book?
A1 Have you ever hit, slapped or punched another kid?
A4 Bit someone?
A13 Stepped on someone's hand or foot on purpose?
A12 Thrown food or water at another person to hurt or tease them
A7 Threw rocks or a hard object at someone?
A15 Tore another kid's clothing?