

A 30-Year Prospective Follow-up Study of Hyperactive Boys With Conduct Problems: Adult Criminality

JAMES H. SATTERFIELD, M.D., KATHERINE J. FALLER, PH.D., FRANCIS M. CRINELLA, PH.D., ANNE M. SCHELL, PH.D., JAMES M. SWANSON, PH.D., AND LOUIS D. HOMER, M.D.

ABSTRACT

Objective: To compare the official arrest records for a large number of hyperactive boys ($N = 179$), most with conduct problems, and 75 control boys; to examine childhood IQ, socioeconomic status, and parent reports of childhood hyperactivity and conduct problems for their contribution to criminal behavior in adulthood; and to compare adult outcome for multimodality-treated (MMT) and drug-treated-only (DTO) hyperactives. **Method:** We report on the official arrest history from early to mid- (18 to 38 years of age) adulthood in these 254 white subjects. **Results:** Ninety one percent of subjects were followed up. California official arrest records were obtained on all of these subjects. Hyperactive subjects had significantly higher arrest, conviction, and incarceration rates compared with controls. Childhood antisocial behaviors, socioeconomic status, and IQ predicted adult criminality. Multimodality-treated boys with Hyperactive/ADHD (attention-deficit/hyperactivity disorder) did not fare better than DTO boys with ADHD. **Conclusions:** Hyperactive/ADHD boys with conduct problems are at increased risk for adult criminality. Hyperactive boys without childhood conduct problems are not at increased risk for later criminality. An intensive 3-year MMT treatment of 6- to 12-year-old hyperactive boys is insufficient to prevent later adult criminality. *J. Am. Acad. Child Adolesc. Psychiatry*, 2007;46(5):601–610. **Key Words:** attention-deficit/hyperactivity disorder, hyperactive, childhood predictors, conduct problems, treatment.

This prospective study of a large sample of clinically referred hyperactive white boys (most with conduct problems; $n = 179$) and community control white boys reports their official arrest history from adulthood to mid-life (18–38 years). We know of only three prior reports of the full official arrest history on an entire cohort of clinically referred hyperactive children and their controls in a prospective study (Mannuzza et al.,

1989; Satterfield et al., 1982; Satterfield and Schell, 1997). The Satterfield et al. (1982) and the Satterfield and Schell (1997) studies followed up the same cohort of subjects with attention-deficit/hyperactivity disorder (ADHD) during adolescence and early adulthood, respectively. The present study includes a follow-up of the same cohort in mid-adulthood. We focused on the following major hypotheses: hyperactive boys are at increased risk for arrests, convictions, and incarcerations compared with a control group; childhood antisocial behavior, socioeconomic status (SES), and IQ (according to Wechsler Intelligence Scale for Children criteria) are predictors of adult criminality; and multimodality treatment in childhood results in a better outcome compared with drug treatment alone. This study for the first time also addresses the following questions: At what adult age are hyperactive subjects at highest risk for offending, does the risk decline with increasing age, and when does it stop?

Longitudinal studies of hyperactive/ADHD children have reliably found relatively high rates of antisocial

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Dr. Satterfield (retired) was formerly with the Division of Child Psychiatry, Department of Psychiatry, Oregon Health Sciences University, Portland; Dr. Faller was formerly with the John Jay College of Criminal Justice in New York City; Drs. Crinella and Swanson are with the Child Development Center, Department of Pediatrics, University of California, Irvine; Dr. Schell is with the Department of Psychology, Occidental College, Los Angeles; and Dr. Homer is retired.

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Correspondence to Dr. James H. Satterfield, 3128 N.E. Alameda St., Portland, OR 97212; e-mail: jimhsat@aol.com.

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behavior in adolescence (Barkley et al., 1990; Klein and Mannuzza, 1991; Mannuzza et al., 1989, 2004; Satterfield et al., 1982, 1987, 1994; Weiss et al., 1979) and adulthood (Barkley et al., 2004; Fischer et al., 2002; Klein and Mannuzza, 1991; Mannuzza et al., 1993; Satterfield and Schell, 1997; Weiss and Hechtman, 1986). Although studies report high rates of antisocial disorders, substantial differences in criminality rates have been reported; no study has been of sufficient follow-up length to obtain an accurate picture of adult criminality.

Mannuzza et al. (1989) compared arrest rates in 103 white adolescent hyperactive subjects and 100 white normal controls (mean age of 18 years for both groups). Significantly more hyperactive than control subjects had been arrested for any offense (39% versus 20%), convicted for any offense (28% versus 11%), arrested for a felony offense (25% versus 7%), and incarcerated (9% versus 1%). Mannuzza and colleagues later interviewed 98% of subjects from the above study (Klein and Mannuzza, 1991; Mannuzza et al., 1993) when they were young adults (mean age of 26 years) and found that significantly more hyperactive than control subjects had a diagnosis of antisocial personality disorder (18% versus 2%).

Weiss and colleagues (1985) reported a 15-year follow-up of 61 young adult (mean age of 25 years) hyperactive subjects and 41 controls and also found that significantly more hyperactive than control subjects had a diagnosis of antisocial personality disorder (23% versus 2.5%). Significantly more hyperactive than control subjects also appeared in court (most for highway offenses) during the 3 years preceding follow-up (18% versus 5%).

In 1982 Satterfield et al. reported an 8-year follow-up (mean age of 17 years) of 110 hyperactive adolescents (89 white, 21 nonwhite) who had received stimulant drugs plus brief counseling as children and 75 white controls. The percentage of these subjects arrested at least once for a serious offense in the lower, middle, and upper socioeconomic classes was 58%, 36%, and 52% compared with 11%, 9%, and 2% for the controls. Institutionalization (juvenile hall, probation camp, residential home) rates for the hyperactive and control subjects were 25% and 1%, respectively. Satterfield and Schell (1997) reported a 14-year follow-up of the same 89 white hyperactive and 75 white control subjects previously evaluated as adolescents. Arrest records

for these subjects as young adults (mean age 22.3 years) revealed that the felony arrest rate for hyperactive subjects was 21 times that of the controls (21% versus 1%). Eight hyperactive and no control subjects (9% versus 0%) were arrested more than once for a felony offense. Eleven hyperactive and 0 control subjects (12% versus 0%) were incarcerated as adults.

Barkley et al. (2004) reported on the lifetime antisocial activities and illegal drug use self-reported at young adult follow-up (mean age of 20–21 years) of 147 hyperactive and 73 control children. The hyperactive group committed a higher frequency of antisocial activities including illegal drug-related activities than the control group. Hyperactives had a greater rate of official arrests for misdemeanor (24% versus 11%) and for felony (27% versus 11%) offenses. Barkley concluded that hyperactive children are at greater risk for antisocial activities and arrests by young adulthood that appear to be principally associated with illegal drug possession, use, and sale.

The present study is a longer (30-year) follow-up of white subjects of earlier studies of drug-treated-only (DTO) hyperactive and normal control boys (Satterfield et al., 1982; Satterfield and Schell, 1997). It is also a continuation of earlier studies (Satterfield et al., 1981, 1987), which evaluated the effectiveness of an individualized multimodality treatment (MMT; see Fig. 1). A 3-year follow-up of 100 MMT-treated hyperactive boys (of whom 76 white subjects are reported here; Satterfield et al., 1981) found a length of treatment effect: subjects receiving more extensive treatment were found to be more attentive, further ahead academically, and better adjusted at school. They also demonstrated less antisocial behavior and better adjustment at home compared with less extensively treated children. In 1987 Satterfield et al. initiated a 9-year follow-up study (mean age of 17 years) to determine whether the more favorable 3-year outcomes observed in the MMT group extended into adolescence. This study compared outcomes of 50 white MMT subjects with those for 81 white DTO subjects. Official teenage arrest and institutional rates were found to be significantly lower in the MMT group. Thus, the favorable preadolescent outcome observed in the MMT group did extend into adolescence. The 50 MMT subjects were further divided into two groups, those who had received less than 2 years treatment (MMT-LT group) and those receiving more (2–3) years' treatment (MMT-MT)

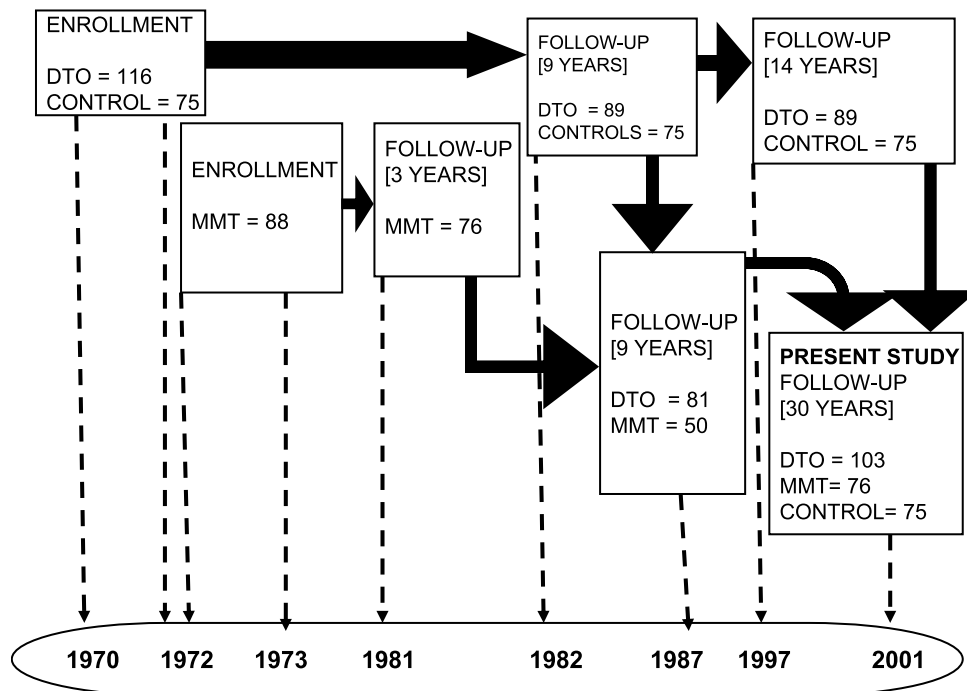


Fig. 1 Study flow diagram: Satterfield et al. cohorts. DTO = drug-treated-only; MMT = multimodality treatment (white subjects only).

group. The data suggested that the low delinquency rate of the MMT-MT subgroup accounted for the reduction in offender rates found for all 50 cases in the MMT group. Treatments given to the MMT-MT group included parent training, individual or group therapy for the child and/or for the parents, family therapy, and educational therapy. In addition to parent training and methylphenidate, the majority (59%) of these families received three or more types of psychotherapy and a sizable subgroup (35%) received four or more types, averaging 3.5 visits per month for 35 months. For a detailed description of psychotherapy modalities and percentages of families receiving each type, see Satterfield et al. (1987).

METHOD

Adult criminality was measured by examining official arrest records recorded by the State of California Department of Justice Bureau of Criminal Identification. Arrest records were obtained for 254 of the 279 ADHD and control subjects (91%). Thirteen DTO and 12 MMT subjects were dropped because of missing data essential to ascertain adult criminal status (Fig. 1). We report only on adult offenses (from age 18 onward). Because subjects were minors when their initial study participation concluded, they could not give informed consent for later review of their adult records. Therefore, the data were collected without informed consent using a

method that unlinked the data from personal identifiers. This design, approved by the California State Department of Justice, conforms to California Penal Code Section 13202, which permits collection of unlinked data on arrests and convictions for purposes of statistical analyses and research studies that do not identify specific individuals.

Subjects

Diagnostic criteria, proband characteristics, and data on the Satterfield rating scales have been extensively described by Satterfield and colleagues in several sources (e.g., Satterfield et al., 1981, 1982, 1987, 1994) and will be reviewed only briefly now. Probanders are 32- to 42-year-old white men who had been diagnosed between the ages 6 to 12 years as hyperactive. Probanders were recruited from consecutive referrals to a psychiatric outpatient clinic specializing in the treatment of hyperactive children at Gateways Hospital in Los Angeles between the years 1970 and 1973. To be included in the study a proband had to be attending school, tested as having normal vision and hearing, tested as having normal intelligence on the Wechsler Intelligence Scale for Children (WISC; full-scale IQ ≥ 80), without a history of psychosis or neurological disorder, and diagnosed as hyperactive by behavioral criteria that required evidence of a chronic symptom pattern of hyperactivity, impulsivity, and poor attention span as reported by parents and teachers. Subjects were evaluated using a variety of measures including psychiatric evaluation and rating scales in which virtually all of the *DSM-III* criteria for ADHD were represented. When the subjects whose data are reported here were originally selected for study, the diagnostic category of Attention-Deficit Disorder was not in use. Nevertheless, the subjects with

TABLE 1
Age, Years at Risk, IQ, and Socioeconomic Status of All Subjects

	Hyperactive	Control	DTO	MMT
No. of subjects	179	75	103	76
Age at follow-up, y				
Mean (SD)	37.3 (1.9)	37.9 (1.7)	38.2 (1.5)	36.1 (1.7)
Range	33–42	32–41	35–42	33–41
Years at risk (SD)	19.3 (1.9)	19.9 (1.7)	20.2 (1.5)	18.1 (1.7)
SES, no. (%)				
Lower	45 (25)	14 (19)	22 (21)	19 (25)
Middle	82 (46)	20 (27)	54 (53)	30 (40)
Upper	52 (29)	41 (54)	27 (26)	27 (35)
WISC full-scale IQ				
Mean (SD)	102.6 (12.6)	115.6 (13.2)	97.0 (13.9)	104.0 (11.0)

DTOs = drug-treated-only; MMT = multimodality treatment; SES = socioeconomic status; WISC = Wechsler Intelligence Scale for Children.

hyperactivity in this study were selected by criteria that are similar to *DSM-III* criteria for Attention-Deficit Disorder with Hyperactivity. Although *DSM-III*, *DSM-III-R*, and *DSM-IV* (American Psychiatric Association, 1994) differ on the exact symptoms and how they are grouped, they are globally consistent (Cantwell, 1996). It is highly likely that all of these subjects would have met criteria for *DSM-IV-TR* ADHD (Hyperactive or Combined types, but not Inattentive type). As used in the present report, “hyperactive” is a diagnostic term referring to the entire group of probands. The diagnosis of conduct disorder was also not in use when these probands were originally seen and diagnosed, and how many probands would have qualified for this formal diagnosis is unknown. However, the Parent Rating Scale used to initially select subjects contained a number of items reflecting Conduct Problems (CP; lying, stealing, and fighting), and 78% of our probands had CP. Thus, in the present report, we use the term “hyperactive” to refer to this group of ADHD subjects with their associated CP.

Control subjects were white boys between 6 and 12 years of age selected from public schools. They were matched to probands for age, sex, and as closely as possible for WISC full-scale IQ. Controls were not evaluated psychiatrically but were evaluated using the Satterfield Teacher and Parent Rating Scales (Satterfield and Schell, 1984). They received a free battery of intelligence and educational tests (valued at \$300). Probands also received a free psychiatric evaluation and treatment recommendations. Some controls and probands were also subjects in neurophysiological studies of attention in which they were paid nickels (up to a few dollars total) for giving correct responses. Each family’s SES was assessed at the time of admission to the study based on the 6-point Duncan scale (Satterfield et al., 1982). This scale was collapsed into a 3-point scale (1, lower; 2, middle; and 3, upper) by combining adjoining classes.

Data Analyses

Group contrasts for continuous variables such as IQ were subjected to *t* test analyses. For contrasts of dichotomous variables such as arrested/not arrested, χ^2 or Fisher exact test values were computed. All probabilities reported are two-tailed. Logistic regression analyses were conducted to ascertain the effect of group membership (proband or control) on the presence or absence of specific events

(arrested, convicted, incarcerated) while controlling for parental SES and childhood IQ obtained on admission to the study.

RESULTS

Subjects’ ages at follow-up, years at risk as adults (after age 18), SES, and WISC Full-Scale IQ for subjects are shown in Table 1.

Arrests, Convictions, and Incarcerations

Offender rates of hyperactives and controls and odds ratio (OR) are shown in Table 2. Hyperactives clearly had substantially greater numbers of offenders than controls in all areas. The mean number of arrests for

TABLE 2
Arrests, Convictions, and Incarcerations

	Hyperactives (179)	Controls (75)	OR	95% CI
Arrested				
Any offense	79 (44.1)	11 (14.7)	4.57*	2.20–10.28
Any felony	69 (38.5)	10 (13.3)	4.06*	1.91–9.46
Multiple felony	47 (26.0)	6 (8.0)	4.08*	1.63–12.25
Convicted				
Any offense	52 (29.0)	6 (8.0)	4.68*	1.88–14.03
Misdemeanor	44 (24.6)	5 (6.0)	4.54*	1.69–15.33
Felony	30 (16.8)	2 (2.7)	7.31*	1.77–40.52
Incarcerated	47 (26.3)	6 (8.0)	4.08*	1.63–12.31

Note: Values represent no. (%).

Fisher exact test **p* < .001.

felony offenses per subject was also significantly greater in the hyperactives (1.37 and 0.43 for the hyperactives and controls, respectively, $t(252) = 2.77, p < .01$).

Logistic Regression Analyses

Controls were found to have significantly higher IQs than hyperactive subjects ($t(252) = 7.05, p < .001$) and to come from families with higher socioeconomic status $\chi^2(2) = 14.8, p = .001$; see Table 1). To further examine the relationship between diagnostic group (hyperactives versus controls) and the outcome measures, and to adjust for the group differences in SES and IQ, we carried out a logistic regression analysis on the felony arrest, multiple felony arrest, conviction, and incarceration variables with group as the main factor and SES and IQ as covariates. For this analysis we dropped 10 probands and 11 control subjects because of missing IQ data. SES and IQ were used as covariates to increase the predictive strength of the model because these variables have been linked to rates of antisocial behavior (West and Farrington, 1973; Hechtman et al., 1984a). This analysis allowed for a test of the significance of the group effect on the dependent variables and a separate test of the significance of the relationship between SES and IQ and outcome to verify our assumption that these covariates were predictive of outcome in the present sample. We hypothesized that both the effect of group and the relationship between the covariates and outcome would be significant. Table 3 summarizes the likelihood ratio χ^2 tests for these two hypotheses for four outcome variables. A significant effect of diagnostic group for each of the four

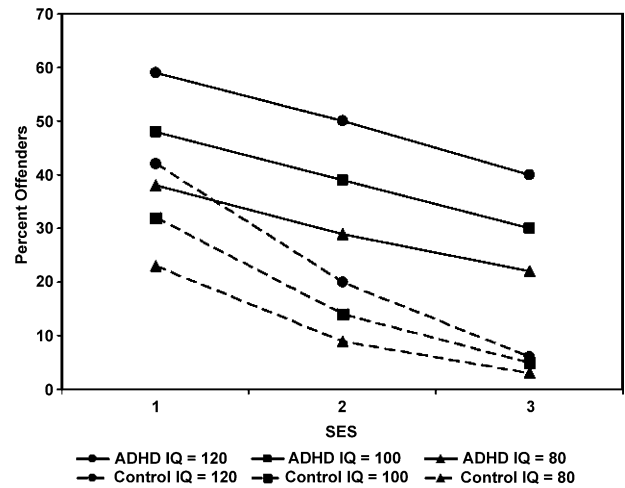


Fig. 2 Logistic regression model illustrating the predictive value of SES and IQ on felony offender rates in ADHD and control subjects.

variables can be seen, even after adjustment for SES and IQ. It is also clear that as expected, SES and IQ were significantly related to outcome. Figure 2 makes clear the importance of SES and IQ in influencing outcome by illustrating their effect on felony offender rates in the two groups. Figure 2 illustrates that the two groups are least separated at SES1, are better separated at SES2, and are best separated at SES3. This figure also illustrates the fact that like controls, hyperactive subjects with either higher IQs or higher social class are at lower risk for felony arrest. The projected offender rates for controls fall more sharply than projected hyperactive offender rates as SES increases, suggesting that SES has a greater influence on offender rates in controls than in hyperactive subjects.

TABLE 3

Comparison of ADHD and Controls on Offender Rates for Felony Arrests, Multiple Felony Arrests, Convictions, and Incarcerations, Using Logistic Regression Analysis, With Group as the Main Factor and SES and IQ as Covariate

Category	ADHD (169)	Control (64)	Predictor	χ^2	df	p
Any felony arrest	37%	9.4%	Group	14.0	3	.0028
			SES and IQ	17.0	4	.0019
Multiple felony arrests	25%	6.3%	Group	9.2	3	.0273
			SES and IQ	15.8	4	.0033
Any conviction	28%	6.3%	Group	19.0	3	.0003
			SES and IQ	30.5	4	.0001
Incarcerated	25%	6.3%	Group	16.8	3	.0008
			SES and IQ	31.9	4	.0001

ADHD = attention-deficit/hyperactivity disorder.

Types of Offenses for Which Subjects Were Arrested

Sixty-nine hyperactive subjects had 228 arrests for felony offenses. Violent crimes included 39 arrests for battery/assault, 11 for robbery, 8 for weapons, 5 for rape, and 2 for attempted murder. Property crimes included 25 arrests for burglary, 20 for grand theft, and 13 for theft. Drug (cocaine, marijuana, narcotics, and other controlled substances) -related crimes included 49 arrests for drug possession, 24 for being under the influence of a controlled substance, and 15 for selling drugs. Drug-related arrests were for nonalcohol drugs, with one exception. The mean number of felony arrests for these arrested hyperactive subjects was 3.30. Misdemeanor arrests included possession of hypodermic needles, vandalism, trespass, evasion of subway/railroad fares, taking a vehicle without consent, petty theft, food stamp violations, presenting a false ID to a police officer, violation of a court order, dissuading a witness from testifying, and damage to a power line. There was only one arrest for a traffic offense (driving under the influence). We do not present similar data for controls because of the small number of subjects (10) with only 24 arrests.

Time Course of Arrests for Felony Offenses

Total offender rates for the 69 hyperactive felony offenders showed a steady decline with increasing age, with 59% arrested between 18 and 21 years, 32% between 27 and 32 years, and 16% between 36 and 38 years. Mean age of desistance (age after which no further arrests occurred) was 30.1 years. The decreasing rate for felony offenders over time has not been adjusted for incapacitation of more severe cases. Despite the considerable magnitude of incarceration associated with criminal offending, however, the age-crime relationship shows little change as the result of adjusting for incarceration (Laub and Sampson, 2003).

Contrast of Outcomes for the Two Treatment Modalities

A previous report of 50 of our MMT and 81 of our DTO hyperactive subjects in adolescence (Satterfield et al., 1987) found that MMT subjects had felony arrests, multiple felony arrests, and institutionalization rates of 27%, 14%, and 8%, respectively, all significantly ($p < .05$) lower than the 43%, 28%, and 22% rates for the 81 adolescent DTO comparison subjects. In the present study adult criminality rates for any

felony arrest, multiple felony arrests, and institutionalizations were 38%, 25%, and 32%, respectively, for the 76 MMT hyperactives compared with 39%, 27%, and 22% for the 103 DTO hyperactives. The DTO and MMT groups were not significantly different on any outcome measure.

In the previous report of adolescent hyperactive subjects (Satterfield et al., 1987), the most treated subgroup (MMT-MT) of the multimodality treated subjects ($N = 26$) had felony arrest, multiple felony arrests, and institutionalization offender rates of 15%, 4%, and 0.0%, respectively, all significantly lower than the rates for their DTO comparison group. In the present study these probands, when 20 years older, had offender rates of 40%, 20%, and 24%. None of these adult MMT-MT criminality rates was significantly different from the 39%, 27%, and 22% offender rates for their DTO comparison subjects.

Childhood Behavior Variables as Predictors of Adult Felony Recidivism

The Satterfield Teacher and Parent Rating Scales (Satterfield and Schell, 1984) were administered to approximately 98% of all subjects when they were originally seen and diagnosed. The rating scale items, arranged in checklist format, allowed teachers and parents to indicate the degree to which each item was present (not at all, just a little, pretty much, or very much). Four CP items from the Parent Rating Scale ("often gets into fights with other children," "lies to get out of trouble," "takes things from other children," "takes money from members of his family") and two factor scores (antisocial and hyperactive) were studied earlier as predictors of juvenile and adult criminality (Satterfield and Schell, 1997). We examined the same six variables as predictors of adult felony recidivism over a longer time. The individual behavioral items were dichotomized into low (not at all and just a little) and high (pretty much and very much) categories; the antisocial and hyperactive factors were also dichotomized (high and low) using a median split. The percentages of felony recidivists among subjects rated high on "lies to get out of trouble," "takes things from other children," "often gets into fights with other children," and the antisocial factor were 35%, 36%, 31%, and 32% compared with 8%, 19%, 16%, and 19% for subjects with a low parent rating on these items ($\chi^2(1) = 14.16, p < .001$; $\chi^2(1) = 6.17, p < .02$;

$\chi^2(1) = 4.32, p < .05$; $\chi^2(1) = 4.26, p < .05$, respectively). Neither the variable "takes money from members of the family" nor the hyperactive factor score significantly predicted adult recidivism. Those probands with one or more childhood conduct problems had a felony recidivist rate of 30% compared with 7.8% for probands without these childhood problems ($p < .01$, Fisher exact test). The recidivism rate of 7.8% for probands without childhood CPs was not significantly different from that of our controls (rate of 8%). The majority (92%) of the adult felony recidivists had one or more of the above childhood CPs.

DISCUSSION

The majority of hyperactive boys followed in this study did not become adult criminals; however, the high rate of adult arrests (44%), convictions (29%), and incarcerations (26%) indicate that a substantial subgroup became serious adult offenders. Compared with controls, after controlling for IQ and SES our hyperactive subjects had significantly higher rates for arrests, multiple arrests, convictions, and incarcerations. These findings are in agreement with previous reports of 89 of our hyperactive boys in adolescence and in young adulthood (Satterfield et al., 1982; Satterfield and Schell, 1997; see Fig. 1). Our findings are also in agreement with follow-up studies by others (Barkley et al., 2004; Mannuzza et al., 1989). These results are also consistent with a follow-up study of 411 boys from London, which reported that in a subgroup of males with hyperactivity and conduct problems, 45% had juvenile convictions and 32% had adult convictions (Farrington et al., 1990). It is difficult to compare our arrest rates with either those of Mannuzza and colleagues or Weiss and colleagues because of differences in both reporting methods and in length of follow-up. In their study of 91 probands (mean age of 26 years) Mannuzza and colleagues reported that 5 hyperactive subjects were incarcerated at the time; they did not report group arrest and incarceration rates. Differences in selection criteria may also have contributed to differences in outcome. For example, Mannuzza et al. (1993) excluded subjects with conduct disorder from their study, whereas we did not, and as noted above most (78%) of our subjects had childhood CP. Weiss and coworkers used self-reports of offending in their follow-up of 64 of 104 hyperactive subjects

(mean age of 25 years), and found that only a minority (3 or 4 subjects) were involved in criminal offenses such as theft, drug possession, or drug dealing (Weiss and Hechman (1986). Their reported low rate of adult offenders could partially be due to a high attrition rate of 38% because others have found that groups that are most at risk for delinquency have the highest attrition rates (Polk and Ruby, 1978), or to the use of self-reports rather than official arrest records.

The felony arrest rate of 27% for hyperactive subjects when followed up in young adulthood (mean age of 20 years) that was found by Barkley et al. (2004) is higher than the felony arrest rate of 21% for young (mean age of 22 years) hyperactive subjects reported by Satterfield and Schell (1997), but both are lower than the arrest rate of 38% found here for older (mean age of 38 years) hyperactive/ADHD subjects. We are unable to compare drug-related arrest rates between the study of Barkley et al. and our study. Our data reveal that 48% of our felony offenders had been arrested for drug, 43% for property, and 41% for violent offenses, but they do not reveal how many arrests in the latter two categories may have been drug related. Our finding that 48% of felony offenders (19% of all probands) had been arrested for drug-associated offenses is consistent with the report of Mannuzza et al. (1993) that 16% of their hyperactive group had an ongoing drug abuse syndrome at follow-up. It is not consistent with Weiss et al. (1985), who did not find probands to be at increased risk for drug abuse as adults. Our finding that the offender rate showed a steady decline with increasing age is consistent with a study of delinquent boys to age 70 (Laub and Sampson, 2003). However, unlike our study they did not find any good predictors of recidivism.

We found the effect of SES on offender rates to be considerable; the rate for low SES probands was nearly twice as high as that for high SES probands. Our logistic regression model (Fig. 2) illustrates the effect of both SES and IQ on projected offender rates. It is clear that for both probands and controls at each SES level offending decreases as IQ increases, and at each IQ level offending decreases as SES increases. Consistent with these results is a study of normal boys that found low family income and low IQ to be a significant predictor of delinquency (West and Farrington, 1973). Also consistent with our results, Hechtman et al. (1984b) in their study of hyperactives as young (mean age of 19

years) adults reported that SES and IQ predict the number of police contacts in adulthood.

Limitations

This study has several limitations. Because it is based on clinically referred white boys, with their specific SES distribution, from an inner-city population it may not be generalizable to other populations. These results also may not generalize to those whose childhood diagnosis was ADHD Inattentive type. Conduct disorder was not diagnosed. Arrest records were obtained only from California. It is probable that some subjects with no California arrest records may have been arrested in other states. Such unobtained arrest records would make our reported rates smaller than the actual arrest rates. Comparison between DTOs and MMTs is limited because although the two groups were well matched on before-treatment variables (Satterfield et al., 1987), they were not randomly assigned groups. Comparisons of criminality rates at two different points in time (in adolescence at age 17 years and again in adulthood at age 38 years) are confounded by the fact that somewhat different groups of subjects are being compared. The strengths of this study are that this was a prospective controlled study in which we were able to examine childhood predictors of adult criminality and that official arrest records were obtained for all subjects who were followed up.

Clinical Implications

As far as we know this is the longest prospective follow-up study of official criminality in clinically referred hyperactive boys. We also believe this is the first study to report that hyperactive/ADHD boys are at increased risk for misdemeanor as well as felony offenses in adulthood with their attendant social costs. That many of our probands were offending after 30 years of age indicates that longer follow-up periods are needed to fully characterize the course of criminal behavior in these subjects.

Behaviors that characterize children with conduct disorder are powerful predictors of subsequent criminal offenses (Loeber and Dishion, 1983); there is broad acceptance of the conclusion that antisocial behavior is the most stable of all childhood behavioral and psychological problems (Robins, 1984). Lying, which

predicted both adolescent and young adult criminal behavior in an earlier study of largely the same subjects (Satterfield and Schell, 1997), also predicted criminality when they were older adults studied here. This suggests that this behavioral variable should always be included in ADHD childhood evaluations. Lying is an almost necessary component of a delinquent career because delinquents often need to verbally conceal their criminal behavior. Because lying is usually manifested much earlier than other delinquent behavior, it is thought to be a precursor of delinquency (Loeber and Stouthamer-Loeber, 1987). Our finding that SES and IQ strongly predict adult criminality suggests that SES and IQ should be included in both the evaluation of hyperactive boys and in assessing risk for later-life criminality.

One possible explanation for the failure of our MMT treatment intervention to prevent adult criminality is that our program began too late in the child's development. In a longitudinal study of 828 subjects from the general population, it was found that high activity levels in the preschool period (specifically at age 3 years) were associated with adult convictions (Stevenson and Goodman, 2001). Serious behavioral problems tend to be established by the age of school entry and to remain stable thereafter (Fischer et al., 1984). Other investigators have concluded, based on the stability data of juvenile conduct problems and delinquency, that intervention can best take place in the preschool and elementary school periods (Gersten et al., 1976; Loeber and Stouthamer-Loeber, 1987). Hyperactive children can be identified at a remarkably early age, before age 5 in 95% of cases (Barkley, 1982) and an average of 2.9 in one study (Stewart and Behar, 1983). Thus, young hyperactive children present an opportunity for early intervention.

Early (preschool) treatment may be a necessary but insufficient intervention to prevent the adult criminality that develops in many hyperactive children. Treatment that begins with preschoolers and continues after transition to elementary grades (Reid, 1993) with periodic therapeutic interventions at critical points through the developmental cycle may be necessary to effect reduction of criminality in this high-risk hyperactive/ADHD with CP population.

From our study, we conclude that it is unlikely that a time-limited (3 year) intensive MMT clinical intervention for boys ages 6 to 12 years will either permanently

eliminate existing antisocial behaviors or protect against their reemergence long after the intervention has ended. Our results suggest that even if treatment results in reduced antisocial behavior in childhood that lasts into adolescence, the reduction may not continue into adulthood. Our disappointing adult outcomes are consistent with a prospective study of young adult outcome (mean age of 21.8 years) of methylphenidate-treated hyperactive children compared with an untreated hyperactive group (Hechtman et al., 1984b) and with a study of a community-based delinquency prevention program, which found that 30 years later the intervention group was worse off than the control group (McCord, 1978). Although results from short-term treatment studies of children with CP are promising (Eddy, 2003), we know of no intervention studies of grade school children at risk for delinquency that have found a beneficial effect on adult criminality.

CONCLUSIONS

As hypothesized, hyperactive boys proved to be at an increased risk for antisocial behavior as adults, and SES, IQ, and childhood CP were related to antisocial outcome. Hyperactive subjects who did not manifest conduct problems as children did not exceed the control group in rates of adult antisocial behavior. MMT did not result in a better adult outcome than did DTO. Offender rates were highest in early adulthood and declined steadily with increasing age, but a small subgroup was still offending in late middle age.

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The Impact of Placement Stability on Behavioral Well-Being for Children in Foster Care David M. Rubin, MD, MSCE, Amanda L.R. O'Reilly, MPH, Xianqun Luan, MS, A. Russell Localio, JD, MS

Objective: The problems children have upon entering foster care can potentially explain prior research findings that frequent placement changes are associated with poor outcomes. This study sought to disentangle this cascading relationship in order to identify the independent impact of placement stability on behavioral outcomes downstream. *Design/Methods:* Placement stability over the first 18 months in out-of-home care for 729 children from the National Survey of Child and Adolescent Well-being was categorized as early stability (stable placement within 45 days), late stability (stable placement beyond 45 days), or unstable (never achieving stability). Propensity scores predicting placement instability based on baseline attributes were divided into risk categories and added to a logistic regression model to examine the independent association between placement stability and behavioral well-being using the Child Behavior Checklist and temperament scores from the National Longitudinal Survey of Youth. *Results:* Half (52%) of the children achieved early stability, 19% achieved later stability, and 28% remained unstable. Early stabilizers were more likely to be young, have normal baseline behavior, have no prior history with child welfare, and have birth parents without mental health problems. After accounting for baseline attributes, stability remained an important predictor of well-being at 18 months. Unstable children were more likely to have behavior problems than children who achieved early stability across every level of risk for instability. Among low-risk children, the probability of behavioral problems among early stabilizers was 22%, compared to 36% among unstable children, showing a 63% increase in behavior problems due to instability alone. *Conclusions:* Children in foster care experience placement instability unrelated to their baseline problems, and this instability has a significant impact on their behavioral well-being. This finding would support the development of interventions that promote placement stability as a means to improve outcomes among youth entering care. **Pediatrics** 2007;119:336–344.