Inattentive and Hyperactive Behaviors and Driving Offenses in Adolescence

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ABSTRACT

Objective: The associations between symptoms of attention-deficit hyperactivity disorder (ADHD), conduct disorder, anxiety, or depression and no disorder in relation to driving offenses were examined in 916 adolescents. **Method:** Self-report and parent report were used to assess a birth cohort of New Zealand adolescents' mental health status at age 15 years. Adolescents who scored 1.5 SD above the mean on the *DSM-III* total ADHD symptom scale were identified as reporting significant ADHD symptomatology. Self-report data and official traffic conviction records were used to identify adolescents who had committed driving offenses between ages 15 and 18 years. **Results:** ADHD symptomatology and conduct disorder were strongly associated with driving offenses. ADHD symptomatology in females was significantly associated with driving offenses and more traffic crashes compared with other disorder or no disorder. **Conclusions:** Adolescents with a history of ADHD and conduct problems are significantly more likely than their peers to commit traffic offenses. Research in ADHD and risky driving should include female adolescents, as those with attentional difficulties are at a high risk for being involved in traffic crashes than females who do not experience attentional difficulties. *J. Am. Acad. Child Adolesc. Psychiatry*, 1997, 36(4):515–522. **Key Words:** attention-deficit hyperactivity disorder, adolescence, driving offenses.

A recent report on adolescent health status in New Zealand found that the mortality rates for New Zealand adolescents were comparable with those for adolescents in third world countries, for example, Cuba and Mexico (Maskill, 1991). National data clearly indicate that the causes of death for young New Zealanders between the ages of 15 and 19 years are largely behavioral in

origin and, furthermore, relate to a relatively limited range of behaviors. In particular, injuries, intentional and unintentional, accounted for 87% of male and 62% of female deaths in this age group during 1991 (Department of Health, 1992a). A review of 10 years' (1979 to 1988) national mortality data identified the leading causes of injury death for this age group as motor vehicle traffic crashes (MVTCs) (65%) and suicide (13%) (Reeder et al., 1992). Death rates for males in this age group, which at the lower bound was marked by the minimum age for motor vehicle licensure in New Zealand (i.e., 15 years), were found to be more than three times higher than for those who were 10 to 14 years old (Maskill, 1991). In addition to fatalities, injuries for the 15- to 19-year-old age group accounted for 49% of male and 11% of female discharges from public hospitals during 1991 (Department of Health, 1992b). National public hospital injury discharge data for the same 10-year period reviewed for fatalities, noted above, indicated that considerable morbidity was associated with the causes identified for fatalities (Department of Health, 1992a). The main

reasons for hospital admission for injury for the 15- to 19-year-old age group were MVTCs (37%), falls (12%), attempted suicide (8%), and assault (6%). MVTCs clearly are a major cause of mortality and morbidity among adolescents in New Zealand.

Many risk factors have been proposed for MVTCs, and included among these factors have been antisocial disorders, substance abuse disorders, and disorders of attention. The United States Department of Transportation, Federal Highway Administration considered attention-deficit hyperactivity disorder (ADHD) as a psychiatric disorder that had potentially a higher risk for problems of driving performance compared with other disorders (Barkley et al., 1993). Despite the attention ADHD has received, there is only limited evidence linking ADHD with risky driving behavior (e.g., excessive speed) and MVTCs. The most significant and recent research has been that undertaken by Barkley et al. (1993). They demonstrated that adolescents with ADHD were more likely than a comparison group to have been involved in MVTCs and to have received more traffic citations. In a case-control study of injury among child bicyclists or pedestrians, it was found that cases scored significantly higher than controls in their parent- and teacher-reported scores on a measure of hyperactivity (Pless et al., 1995). The generalizability of Barkley and colleagues' findings was limited by several factors, including a reliance on parental reports for driving-related outcomes, use of a predominantly male sample, no measures of exposure to driving, and a brief window of driving history. Barkley et al. (1993) suggested that future research should attempt to replicate their findings, extend their study by including self-report estimates of the various outcomes, and obtain traffic offense data from government databases.

In the present study some of these methodological shortcomings were addressed by including information from self-report and official national traffic conviction records. The main aim of the study was to determine whether high levels of self-reported inattentive and hyperactive behaviors at age 15 were significantly associated with high rates of driving offenses and involvement in MVTCs between ages 15 and 18 years. A secondary aim was to find out whether there were gender differences in the associations between ADHD symptoms and driving offenses.

METHOD

Sample

The sample is part of a cohort of adolescents enrolled in the Dunedin Multidisciplinary Health and Development Study (DMHDS). A full description of that study is given elsewhere (Silva, 1990). In summary, the study follows the health, behavior, and development of a cohort of children who were born between April 1, 1972, and March 31, 1973, at Queen Mary Hospital, Dunedin, New Zealand. There were 1,139 children eligible for inclusion in the study, of whom 1,037 were followed up and assessed at age 3 years. Of the 1,037 children, 991 were followed up at age 5 years, 954 at age 7 years, 955 at age 9 years, 925 at age 11 years, 850 at age 13 years, 976 at age 15 years, and 988 at age 18 years. By age 18 there had been 10 deaths, 3 from a car crash and 1 from a motorcycle crash. Four members of the cohort could not be traced, 5 had severe intellectual disablement which precluded assessment, and 30 declined or were unable to participate.

The cohort is predominantly of European origin and at age 3 was underrepresentative of the Maori and Pacific Island population (3% compared with 12% for New Zealand). At age 3 the sample was slightly advantaged in terms of socioeconomic status, when the children's fathers were compared with all males in the New Zealand labor force (Silva, 1990). Subsequently, a comparison was made between the fathers of those cohort members interviewed at age 15 years and the population of males who were identified from the 1986 New Zealand Census database as being the father of a child of similar age (Reeder et al., 1994). This confirmed that the DMHDS fathers were socioeconomically advantaged. Furthermore, the pattern of advantage was found to extend to the DMHDS mothers as well. However, all levels of socioeconomic status were adequately represented by the sample (Reeder et al., 1994).

Measures

Mental Health at Age 15. At age 15 years, the mental health of 916 adolescents was assessed with a modified version of the Diagnostic Interview Schedule for Children (DISC-C) (Costello et al., 1982) in a face-to-face interview. The full DISC-C was condensed to include only those items with the highest item-total correlation with each of the *DSM-III* (American Psychiatric Association, 1980) criterion symptoms. Thus, each *DSM-III* criterion symptom for any disorder in the shortened DISC-C was assessed by a single question. Original follow-up questions were retained where appropriate (McGee et al., 1990). DISC-C items were scored for symptom endorsement in diagnostic decision-making. Only responses coded 2 ("a definite yes") to the DISC-C questions were used to indicate the presence of criterion symptoms for anxiety, depressive, and attention deficit disorders (McGee et al., 1990). Conduct disorder was assessed via a self-report delinquency scale developed by Moffitt and Silva (1988). Symptom scale scores were calculated for anxiety, depressive, conduct, and attention deficit disorders by summing affirmative responses to questions on each scale (McGee et al., 1990).

Parent reports, via the Revised Behavior Problem Checklist (Quay and Peterson, 1987) and other questionnaires on family background, were used to confirm adolescent report of disorder (McGee et al., 1990).

ADHD Symptomatology and Disorder Groups. At the age 15 assessment, disorders of attention were assessed using *DSM-III*

criteria for attention deficit disorder with or without hyperactivity (McGee et al., 1990). Subsequent changes to the diagnostic system have emphasized the importance of hyperactive behaviors in defining the disorder of ADHD. At age 15 years, very few adolescents fulfilled the criteria for a disorder of inattention (Schaughency et al., 1994), and those who did fulfill the criteria tended to meet criteria for "residual" forms of the childhood disorder (McGee et al., 1990). Therefore, the strategy adopted in the present study has been to use a dimension of ADHD (Schaughency et al., 1994) to identify those adolescents scoring high on these behaviors. Schaughency et al. (1994) used this procedure to examine behavioral and academic correlates of ADHD behaviors using the same cohort at ages 15 and 18 years. They concurred with Barkley and colleagues' argument that as the prevalence of ADHD symptoms declines in the normal population of this age group, lower cutoff scores may be more appropriate in defining significant ADHD problems than the criteria specified in the *DSM* (Schaughency et al., 1994). Thus, they used a psychometric approach, similar to that used by Barkley et al. (1993) to identify adolescents with significant ADHD symptoms as those who scored greater than 1.5 SD above the mean on a total score of the DISC-C ADHD items (Schaughency et al., 1994).

The cutoff score used in the present study corresponded to approximately the 91st percentile of the distribution of total scores on the ADHD symptom scale. As there were no gender differences on self-reported attention problems, cutoff scores on the DISC-C scale were not gender-specific (Schaughency et al., 1994). The mean symptom score on the ADHD scale was 7.2, and the scores ranged from 1 to 30. Using the procedures outlined by Schaughency et al. (1994) resulted in 101 (11%) of the 916 study members being identified as reporting ADHD symptomatology at age 15, with and without a history of disorder in childhood (confirmed by parent report). Of this group, *DSM-III* criteria were met by 31% for a conduct/oppositional disorder and 25% for an anxious/depressive disorder. Four individuals met criteria for attention deficit disorder-residual type (ADD-R). Forty-one percent did not meet criteria for disorder.

The remainder of the sample was divided into three groups. The first group comprised study members who met *DSM-III* criteria for conduct or oppositional disorder ($n = 46$) and will be referred to hereafter as the conduct group; four in this group also had an anxious or depressive disorder and were included in the conduct group to maximize sample size; one met criteria for (ADD-R). The second group comprised those who met *DSM-III* criteria for anxious or depressive disorders ($n = 85$); two in this group also met criteria for ADD-R. The third group ($n = 684$) comprised study members who did not meet criteria for any of the *DSM-III-R* disorders assessed in this study.

Official Traffic Conviction Records. Permission was obtained from the adolescents to search the national database maintained by the Land Transport Safety Authority, where a record of all officially reported motor vehicle driving offenses are kept. Details of the number and nature of such offenses between 15 and 18 years of age for each member of the study were sought. Offenses related to driving while intoxicated with alcohol, careless driving (e.g., reckless driving causing injury/death, driving at a dangerous speed), failure to comply with the Graduated Driver Licensing System (GDLS) restrictions for car drivers as described by Begg et al. (1995) (e.g., learner driver unaccompanied), and breaking other license laws (e.g., driving while disqualified, driving without a license) were selected for inclusion in the study.

The analyses reported here were confined to drivers. Drivers at age 18 were defined as those who could take full control of a vehicle on a public road for at least 1 kilometer, irrespective of license status.

Self-Reported Driving Offenses. MVTCs are the main cause of death and a major cause of hospitalization for the age group of interest. At age 18, as part of a broader Injury and Transportation interview for the DMHDS, members of the study were asked to recall all MVTCs in which they had been involved since their 15th birthday that resulted in injury to themselves or to others. MVTCs are a specific group of injury outcomes defined by the *International Classification of Diseases* E (external cause of injury and poisoning) codes 810 through 819 (World Health Organization, 1980). There were 130 such crashes reported by 56 individuals which occurred on public roads and required medical treatment for an injury. Of the traffic crashes, only those in which the adolescent was the driver ($n = 56$ or 43%) were included. Nontraffic crashes (i.e., crashes that occurred off-road) were excluded from the analyses as they are, relatively, a far less common cause of serious injury. Furthermore, motor vehicle crashes that occur entirely off public highways have been allocated a separate range of E codes, in recognition of the very different environments within which they occur.

The present study focused mainly on driving offenses rather than crashes because crashes are a relatively rare outcome and are, therefore, a more appropriate focus for a case-control rather than a cohort study of relatively small size. Self-reports are usually more complete than official records because a percentage of crashes are not reported to the authorities. Only crashes that result in an injury and crashes that result in damage to property, the owner of which cannot be located, are required to be reported (i.e., injury crashes within 24 hours, property damage within 48 hours of the crash).

In addition to crash information, self-reported breaches of the GDLS (Begg et al., 1995) for car drivers or motorcyclists—driving within 2 hours of drinking alcohol, not using a seat belt while driving, and not wearing a helmet while riding a motorcycle—were obtained. Given the focus of the study on the GDLS and on compliance with its conditions, full self-report data on all driving offenses were not obtained at age 18 years.

We used χ^2 tests and analyses of variance (ANOVA) to examine associations between disorder groups and driving offenses, and when appropriate, Fisher's Exact Test (two-tailed) was used.

Procedures

Study members attended the research unit close to their 15th and 18th birthdays. Before attending the research unit they received descriptions of the assessments, procedures, and consent forms. Permission to access official records was requested before the adolescents were interviewed. At ages 15 and 18 adolescent written consent was obtained, and at age 15, parental written consent was also obtained for the adolescent to participate in the study.

RESULTS

Mean Symptom Scores at Age 15

The four groups were compared by ANOVA on the mean symptom scale scores for anxiety, depression,

ADHD, and conduct problems in a model that comprised group and gender as main effects and an interaction term between both main effects. Mean symptom scores for each group are presented in Table 1, for males and females separately.

There were significant differences between groups on all four symptom scores. Pairwise differences between groups were examined by post hoc Scheffé tests. The ADHD symptom group scored significantly higher than the remaining three groups on the ADHD symptom scale. By and large, the other diagnostic groups had low scores on the ADHD scale.

Similarly, the conduct group and the anxious/depressive groups scored significantly higher than the other groups on the conduct and anxiety symptom scales, respectively. The anxious/depressive group's mean total symptom score on the depression scale was significantly higher than the mean total symptom scores for the ADHD symptom group, but it did not differ significantly from the mean score for the conduct group. All three disorder groups scored significantly higher than the no disorder group on the depression symptom scale.

The interaction between group and gender was significant for the mean scores on the ADHD scale ($F[3,908] = 2.50$, $p < .05$); males in the anxious/depressive and no disorder groups scored significantly higher than females on the ADHD symptom scale, and females in the conduct disorder group scored

significantly higher than males in the same group on the ADHD scale. However, these differences amounted to about 1.0 point on the ADHD scale.

Males and females did not differ significantly in their mean symptom scores on the ADHD and conduct scales.

Driving Offenses From Official Traffic Conviction Records

Significant results from within-gender analyses comparing groups on the number of official traffic convictions for driving offenses committed between ages 15 and 18 years are presented in Table 2. Although cell sizes for most within-gender comparisons were small, it was considered preferable to present and analyze data for each gender separately because there may be different associations between ADHD symptoms and driving offenses for males and females. For all comparisons in Table 2, Fisher's Exact Test was used because some expected cell frequencies were less than five.

Males who reported significant symptoms of ADHD (15%) or conduct disorder (14%) at age 15 compared with other males had significantly more frequently committed offenses related to the GDLS. Other types of license offenses were most frequently committed by males in the conduct group (14%). Males in this group were also more likely than other males to have committed driving offenses associated with the consumption of alcohol. Females in the conduct group at age 15 (7%) compared with other females committed

TABLE 1
Gender Differences in Mean Symptom Scores for Anxiety, Depression, ADHD, and
Conduct Problems at Age 15 ($N = 916$) Among Groups

Mean Symptom Score	Gender (M = 470; F = 446)	ADHD Symptomatology[a] (M = 55; F = 46)	Conduct Disorder (M = 20; F = 26)	Anxious/ Depressive Disorder (M = 32; F = 53)	No Disorder (M = 363; F = 321)
Anxiety	Male	11.0	6.7	16.0	6.3
	Female	13.5	8.9	17.3	8.3
Depression	Male	4.5	6.1	7.0	1.5
	Female	10.4	7.8	11.5	1.7
ADHD	Male	17.1	7.3	7.9	5.8
	Female	18.0	8.5	6.8	5.3
Conduct	Male	10.7	15.5	3.9	2.3
	Female	9.7	12.0	3.3	2.0

Note: ADHD = attention-deficit hyperactivity disorder.
[a] Scored higher than 1.5 SD above the mean on the ADHD symptom scale of the Diagnostic Interview Schedule for Children.

TABLE 2
Proportion of Males and Females in Each Group Who Committed Driving Offenses
Between Age 15 and 18 as Noted in Official Traffic Records of Offenses

Driving Offenses Between Ages 15 and 18	ADHD Symptomatology[a] (M = 46); F = 27)		Conduct Disorder (M = 14; F = 14)		Anxious/ Depressive Disorder (M = 22; F = 38)		No Disorder (M = 303; F = 220)		Fisher's Exact Test[b] Probability
	n	%	n	%	n	%	n	%	
GDLS offenses									
Males	7	15	2	14	0	0	7	2	.001**
Females	0	0	0	0	0	0	2	1	1.000
Other license offenses									
Males	3	7	2	14	2	10	3	1	.001**
Females	1	4	1	7	0	0	0	0	.003**
Alcohol offenses									
Males	4	9	2	14	3	14	5	2	.001**
Females	1	4	0	0	0	0	1	1	.272
One or more offenses[c]									
Males	9	20	4	29	5	23	25	8	.003**
Females	3	11	1	7	0	0	4	2	.029*

Note: ADHD = attention-deficit hyperactivity disorder; GDLS = Graduated Driver Licensing System.
[a] Scored higher than 1.5 SD above the mean on the ADHD symptom scale of the Diagnostic Interview Schedule for Children.
[b] Fisher's Exact Test was used as the expected frequency for some cells was less than five.
[c] Sum of alcohol, careless driving, and GDLS offenses.
* $p < .05$; ** $p < .01$.

significantly more license offenses between the ages of 15 and 18 years that were not associated with the GDLS. However, as this analysis was based on very few cases, not very much weight should be placed on the significance of this finding.

As few adolescents had committed any particular driving offense, the total number of offenses by males and females was examined. Overall, a significantly greater proportion of males in the conduct group (29%) than males in the rest of the sample reported that they had committed one or more driving offenses at age 18. In contrast, significantly more females in the ADHD symptom group (11%) than in the other groups had committed at least one driving offense at age 18. There were no significant gender differences for any of the comparisons.

Self-Reported Driving Offenses

The young drivers provided information on their own driving behavior and offenses for the 12-month period that preceded their interview at the Dunedin Research Unit when they were aged 18 years. A summary of the findings with Fisher's Exact Test and χ^2 test as appropriate is presented in Table 3.

Where there were significant associations with groups, it was clear that those with either significant ADHD symptoms or conduct disorder were more likely than the rest of the sample to report driving offenses. A significantly greater proportion of males with anxious/depressive (32%) or conduct (29%) disorders compared with other males in the sample at age 15 reported that they had driven without a license when they were questioned at age 18 years. Males with conduct disorder (29%) were significantly more likely than other males to not always wear a seat belt when driving. Breaking conditions of the learner permit (one component of the GDLS) was significantly more frequently reported by males in the conduct disorder and ADHD symptom groups. Males in the ADHD group (45%) were significantly more likely than other males to drive a car within 2 hours of consuming alcohol.

Females with conduct disorder at age 15 (46%) were significantly more likely than other females to have driven without a license at age 18. Significantly more females in the ADHD symptom group (19%) than females in the other groups reported that they

TABLE 3
Proportion of Males and Females in Each Group (as Defined at Age 15) Who Reported Driving Offenses at Age 18

Driving Offenses at Age 18	ADHD Symptomatology		Conduct Disorder		Anxious/ Depressive Disorder		No Disorder		Fisher's Exact Test Probability
	n	%	n	%	n	%	n	%	
Drove without a car license									
Males	11	25	4	29	7	32	42	14	.022*
Females	7	29	6	46	9	24	19	9	.000**
Did not always wear a seat belt									
Males	9	20	4	29	2	10	11	3	.000**
Females	1	4	2	15	1	3	6	3	.125
Broke learner license conditions									
Males	8	100	1	100	0	0	15	63	.001*
Females	3	75	0	0	1	25	10	29	.220
Drove within 2 hr of drinking alcohol									
Males	20	45	5	38	4	18	80	27	.044[a]*
Females	8	31	3	23	14	38	46	21	.132[a]
One or more traffic crashes[b]									
Males	3	7	2	14	4	18	20	7	.131
Females	5	19	0	0	0	0	10	5	.016**

Note: ADHD = attention-deficit hyperactivity disorder.
[a] Probability associated with a χ^2 test (3 df).
[b] Between ages 15 and 18 years.
* $p < .05$; ** $p < .01$.

were involved in one or more traffic crashes between the ages of 15 and 18 years.

Gender differences were significant only for driving offenses associated with alcohol consumption. Significantly more females (20%) than males (4%) in the anxious/depressive disorder group reported driving a car within 2 hours of consuming alcohol (χ^2 with 3 $df = 12.93$, $p = .005$).

A similar set of comparisons was made for motorcycle-riding offenses and behaviors among the four groups. The only comparison that was statistically significant was consuming alcohol within 2 hours of riding a motorcycle, which was significantly more frequently reported by males in the ADHD symptom group (42%) than males in any of the other three groups.

DISCUSSION

The main finding of the study was that a significantly higher proportion of adolescents in the ADHD and conduct groups compared with the other groups had committed a driving offense. This finding applied to self-reported offenses and those recorded in official traffic conviction records. Significantly more males with conduct disorder compared with other males received an official traffic conviction for a driving offense. ADHD symptomatology compared with other disorders was more strongly associated with traffic crashes and driving offenses in females.

As stated previously, a better measure of risky and dangerous driving behaviors is the study subject's self-report compared with official traffic conviction records. The latter contain only crashes that resulted in injury to the occupant or damage to property and are, therefore, less complete than self-report. The findings from self-report in the present study mirrored those from official traffic records, in that significantly more individuals from the conduct disorder (predominantly) and ADHD symptom groups compared with the rest of the sample acknowledged having committed driving offenses. Males in the ADHD group were significantly

more likely than other males to report that they had driven within 2 hours of consuming alcohol. This finding was not supported by official traffic conviction records on alcohol-related driving offenses; instead, a higher proportion of males in the conduct disorder and anxious/depressive groups had received an alcohol-related traffic conviction.

The results are to some extent a replication *and* an extension of the findings reported by Barkley et al. (1993). In that study, adolescents with ADHD were more likely than their peers to have " . . . auto crashes, to have had more such crashes, to have more bodily injuries associated with such crashes, and to be at fault for more crashes . . ." (p. 212). They were also more likely to receive traffic citations and more such citations than the rest of the sample, predominantly for speeding. The considerable comorbidity between ADHD and oppositional defiant disorder or conduct disorder precluded Barkley and colleagues from concluding that ADHD per se or other disorders were more likely to be associated with adverse driving behaviors and traffic citations. Other limitations to their study included the lack of self-reported information and official records and the use of a predominantly male sample. These limitations were overcome in the present study by examining information from self-report and official traffic conviction records and by including a representative sample of adolescent females. Both studies were similar in that only a brief window (2 years) on driving behaviors was available for adolescents.

One of Barkley and colleagues' (1993) suggestions for future research in this area was to try to determine the contribution of ADHD and conduct symptoms to driving offenses. Their study was unable to examine this issue because of small sample size and an unrepresentative sample. In the present study, it was possible to identify separate groups within the sample, with predominantly ADHD symptomatology, conduct disorder, and anxious or depressive disorders. As described above, comorbidity within groups was present; however, the conduct group appeared to be relatively pure, with 89% of that group meeting criteria only for conduct/oppositional disorders. Nearly one third in the ADHD symptom group, however, met *DSM-III* criteria for a conduct (aggressive and nonaggressive) or oppositional disorder at age 15. This may partly account for the finding that no clear relationship was evident in the results to suggest that ADHD symptoms

per se were more likely than conduct/oppositional disorders to be significantly associated with driving offenses.

Nevertheless, despite the high comorbidity, the ADHD individuals scored significantly higher than the conduct group on the ADHD symptom scale, and similarly the individuals in the conduct group scored significantly higher than the ADHD symptom group and other groups on the conduct symptom scale. This suggests some face validity for the independence of the four groups defined in this study. Many of the significant associations between the groups and driving offenses would suggest that the contribution of ADHD symptomatology, relative to conduct disorder at age 15, in committing driving offenses during adolescence was minimal in this community sample.

Unlike the study by Barkley et al. (1993), the present study included a relatively pure group of individuals who met *DSM-III* criteria primarily for a conduct or oppositional disorder. Among males, most of the driving offenses noted in official traffic conviction records were associated with conduct/oppositional disorder rather than ADHD symptomatology. Among females, however, driving offenses and breaking the driving regulations were more likely to be noted for those who scored high on the ADHD symptom scale than those who met criteria for conduct/oppositional disorder. With regard to official traffic conviction records, it is possible that the differences observed between driving offenses and ADHD symptoms or conduct disorder for males and females may be an artifact of reporting bias. Perhaps females who exhibit reckless and risky driving behaviors are more likely than their male peers to be arrested by traffic authorities for such offenses, whereas males are perhaps more likely to be arrested if they also exhibit those behaviors in a specific context (e.g., while under the influence of excess alcohol or while involved in delinquent activities), that is, activities that could be regarded as meeting partial criteria for conduct disorder.

The significant association observed between females with significant ADHD symptoms and their committing at least one self-reported driving offense has an interesting parallel in previous work with the DMHDS sample. A study of the predictors of motorcycle riding, a high-risk activity, showed that the strongest predictor of riding among females in the present cohort was a high ADHD symptom score at age 15 (Reeder, 1994);

high scorers on the ADHD scale at age 15 were more than three times as likely than those who scored lower on the same scale to be motorcycle riders at age 18 years. The findings may be partially explained by examining the continuity of disorder. Feehan et al. (1993) reported that the continuity of disorder from age 15 to 18 was strong. Among those who reported disorder at age 15, adolescents with internalizing disorders (anxious/depressive) continued to report significant symptoms of those disorders at age 18. However, those with externalizing disorders (attentional difficulties and conduct disorder) at age 15 reported symptoms of both internalizing and externalizing disorders at age 18 (Feehan et al., 1993).

McGee et al. (1987) suggested that *DSM-III* criteria may underidentify adolescent females with ADHD despite self-reported impairment associated with attentional difficulties. Likewise, Schaughency et al. (1994) concluded from their study that because there were no significant differences between males and females in self-reported inattention problems in adolescence, the potential for underrecognizing females with attentional difficulties remained. The results from the present study and those reported by Feehan et al. (1993) on the continuity of disorder support Schaughency and coworkers' (1994) suggestion that ADHD symptoms in adolescence may be " . . . indicative of general pathology rather than reflective of a specific attention deficit disorder (ADD) syndrome" (p. 183).

To conclude, the present study showed that risky driving behaviors cannot be entirely explained by ADHD symptomatology. Conduct or oppositional disorder was more frequently associated with driving offenses. The limitations of small sample size and comorbidity between ADHD and conduct/oppositional disorder noted in the present study are likely to apply to other studies of ADHD symptomatology in adolescence. However, compared with previous studies that have examined this issue, the strengths of the present study were that a representative sample of adolescents from the general population provided self-report data on their driving behaviors, independent data on the adolescents' driving behaviors were available from official traffic conviction records, and a comparison was made between a group who reported significant ADHD symptoms with other disorder groups, especially those with a single diagnosis of conduct or oppositional disorder. On the basis of the findings

from the present study, it would be inappropriate to make recommendations for public policy on reducing the incidence of risky and dangerous driving among adolescents. However, clinicians may wish to forewarn adolescents with a history of significant ADHD symptomatology, conduct disorder, or oppositional disorder that they should take care when driving, as they are at a higher risk than their peers for driving dangerously and being involved in traffic crashes, which may result in an injury to themselves or others.

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