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Few Girls With Childhood Attention-Deficit/Hyperactivity Disorder Show Positive Adjustment During Adolescence

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Abstract

Employing data from 140 prospectively followed girls with attention-deficit/hyperactivity disorder (ADHD) and 88 age- and ethnicity-matched comparison girls, we adopted a person-centered analytic approach to assess rates of adolescent positive adjustment (PA) across six domains: ADHD symptoms, externalizing symptoms, internalizing symptoms, social skills, peer acceptance, and school achievement. During adolescence, between 19.8% and 61.1% of the girls with childhood ADHD met criteria for PA when the six domains were considered independently. A total of 16.4% of the ADHD sample showed PA in at least five of six domains, versus 86.4% of the comparison girls. Results were similar when PA was examined excluding the ADHD symptom domain. Most girls did not “grow out of” the symptoms and impairments related to their ADHD.

Keywords

ADHD; positive adjustment; adolescence; girls

Findings from prospective, controlled longitudinal studies of children with attention-deficit/hyperactivity disorder (ADHD) yield three overall conclusions: (a) during adolescence, the majority of youth with ADHD maintain clinically-significant symptom levels, such that ADHD does not disappear with the advent of puberty, as formerly believed, (b) most perform worse across both symptom and impairment domains than do comparison youth, and (c) there is substantial outcome variability across individuals and domains (Barkley, Fischer, Smallish, & Fletcher 2002; Biederman, Faraone, Milberger, & Guite, 1996b; Hinshaw, Owens, Sami, & Fargeon, 2006; Satterfield, Swanson, Schell, & Lee, 1994; Weiss & Hechtman, 1993). Furthermore, in certain domains children often improve (e.g., hyperactivity tends to decrease; see Hart, Lahey, Loeber, Applegate, & Frick, 1995; Hinshaw et al., 2006), whereas in others children may continue to struggle (e.g., school achievement; see Biederman et al., 1996b). Despite progress toward understanding the longitudinal course of ADHD, it is still essentially unknown to what extent positive adjustment (PA) *across* multiple relevant domains during adolescence occurs. In other words, what proportion of children with ADHD fares reasonably well across important domains of adjustment during adolescence? In order to address this question, we used data from a prospective sample of girls with and without ADHD to identify

those who during adolescence are positively adjusted across symptom and impairment domains.

Childhood ADHD is associated with increased likelihood of negative outcomes during adolescence, including persistent ADHD diagnoses and symptoms (e.g., Biederman, Faraone, Milberger, Curtis, Chen et al., 1996a; Hinshaw et al., 2006), substance use problems (Molina & Pelham, 2003) and comorbid mental disorders (August, Realmuto, Joyce, & Hekter, 1999; Biederman, Mick, Faraone, & Burbach, 2001; Hinshaw et al., 2006), as well as difficulties in other domains, including internalizing problems and academic underachievement (Barkley et al., 2002; Hinshaw et al., 2006; Lee & Hinshaw, 2006; Weiss & Hechtman, 1993; Young, Hepinstall, Sonuga-Barke, Chadwick, & Taylor, 2005). Indeed, the overwhelming focus has been on negative outcomes, with little attention to instances of PA. The vast majority of participants in these studies have been boys, with some key studies employing all-male samples (e.g., Biederman et al., 1996a, 1996b). Furthermore, in this literature, analytic approaches have been primarily variable-based (even though certain outcomes may be dichotomous, e.g., presence versus absence of disorder). In other words, questions have typically involved the average developmental outcome of boys with ADHD in terms of rates of disorder or symptom levels. Most reports have not established proportions of children showing positive outcomes, especially those that transcend the absence of symptoms per se.

The exception is Lee, Lahey, Owens, and Hinshaw (2008), in which a mostly-male (82%; 18% female) sample of 255 preschool-aged children with and without ADHD was followed into adolescence in order to ascertain functional impairment and psychological symptoms across developmentally-relevant domains. In this report we perform a systematic replication of their novel methods and findings. Our work extends theirs by using a community-based sample of children with and without ADHD and by including school achievement as a primary outcome domain. Additionally and importantly, we use an all-female sample. Prospective follow-up of girls with ADHD is rare, with Biederman et al. (2006, 2007), Hinshaw et al. (2006), and Young et al. (2005) serving as notable exceptions. Findings regarding the outcome of girls with ADHD add to the currently limited database. Furthermore, the developmental outcome of girls with ADHD may be different from that for boys because (a) language and intellectual deficits seem to occur more frequently among girls versus boys with ADHD (Gaub & Carlson, 1997), and (b) the Inattentive type may be more common among girls versus boys. Hinshaw et al. (2006) hypothesized that ADHD in girls may demonstrate multifinality (i.e., a wider range of developmental outcomes) more often than it does in boys. Consequently, the rate of PA across domains in girls may actually be lower than it is in boys.

Critically, most studies have also concerned outcome in a single domain, typically ADHD-related diagnosis or symptoms (Biederman et al., 1996a; Barkley et al., 2002; Hart et al., 1995), substance use problems (Biederman, Wilens, Mick, & Faraone, 1997; Lambert & Hartsough, 1998; Molina & Pelham, 2003), or behavioral/conduct problems (August et al., 1999; Biederman et al., 2001; Fischer, Barkley, Fletcher, & Smallish, 1993; Satterfield et al., 1994). Although some consider outcome in multiple domains separately (Biederman et al., 1996b; Greene, Biederman, Faraone, Sienna, & Garcia-Jetton, 1997; Hinshaw et al., 2006; Latimer, August, Newcomb, Realmuto, Hektner, et al., 2003; Lee & Hinshaw, 2006; Young et al., 2005), only Lee et al. (2008) considered outcomes in multiple domains simultaneously. We believe that such consideration is essential, as one would not deem a child with ADHD to be positively adjusted during adolescence unless she performed similarly to youth without childhood mental disorders across a set of important outcome domains. It is questionable what can be concluded when children with ADHD evidence poor outcome in a single developmental domain (e.g., substance use *or* peer rejection *or* underachievement), without considering concomitant performance in other relevant domains.

We contend that PA in adolescence assumes an absence of clinically significant psychopathology as well as competence in social and academic domains (Masten & Coatsworth, 1998) and that approaches integrating these multiple domains are of paramount importance. This clinically meaningful and comprehensive view of adjustment is generally lacking in the extant literature regarding follow-up of children with ADHD. Consequently, a key question concerns rates of overall PA in this population. Certainly not all children with ADHD develop or continue to have conduct problems, become substance abusers, or show poor school achievement. Can we identify those who positively adjusted (i.e., doing reasonably well overall) during adolescence?

Strategies for measuring PA vary widely (for a review, see Luthar, 2006). Issues include whether PA should be assessed in one or multiple domains; should be defined as functioning that is adequate, exceptional, or better than expected; and should involve groups demonstrating PA (i.e., be person-centered; see Bergman & Magnusson, 1997) or should involve higher versus lower scores on a continuously-measured variable (i.e., be variable-centered). We define PA as outcome that is better than expected, in the sense that functioning within the normal range in the domains we have assessed is not typical among children with ADHD. We also assess PA across multiple domains and adopt a person-centered approach, in which we group children according to the degree to which they share certain attributes. Thus, our findings support statements about types of children, and our approach is in accordance with the emphasis on clinical relevance and significance in child psychopathology research (Kazdin, 1999). By contrast, variable-centered analyses typically involve linear relations among individual variables that preclude conclusions about children per se.

Specifically, we identified adolescent girls who surpassed certain thresholds for PA in six domains: ADHD symptoms, internalizing symptoms, externalizing symptoms, social skills, peer acceptance, and school achievement. These six domains were chosen because the lack of psychiatric symptoms, adequate school achievement, and success with peers are necessary components of competence during adolescence (Masten & Coatsworth, 1998) and because they represent core or associated features of ADHD (see Hinshaw, 2002a). Whereas each of these domains is important in its own right, we consider them simultaneously (as well as individually) because together they can help to define youth with optimal versus sub-optimal developmental outcome; that is, together they can identify who is doing well overall. Cicchetti, Rogosch, Lynch, and Holt (1993), Owens and Shaw (2003), and Buckner, Mezzacappa, and Beardslee (2003) employed similar strategies for identifying positively adapted individuals. Additionally, because a majority of our participants were selected on the basis of a childhood diagnosis of ADHD, we also calculated rates of PA *excluding* ADHD symptoms. This procedure allowed us to examine rates of PA across domains that were not related to initial selection criteria.

In sum, we extend the previous literature on the outcome of childhood ADHD by (a) focusing on PA, (b) assessing outcome across several domains simultaneously, (c) adopting a person-centered approach, and (d) using an all-female, community-based sample. Our general hypothesis is that despite improvements in ADHD symptoms and associated impairments demonstrated using variable-based analyses, person-centered analyses will reveal that relatively few girls with childhood diagnoses of ADHD are positively adjusted during adolescence, compared to age- and ethnicity-matched children without ADHD. Using Lee et al. (2008) as a base, we address the following specific questions: (1) How many girls with versus without diagnoses of ADHD meet criteria for PA during adolescence in six separate domains: ADHD symptoms, externalizing problems, internalizing problems, social skills, peer acceptance, and school achievement? (2) Among those with and without childhood diagnoses of ADHD, how many are positively adjusted overall *across* outcome domains during

adolescence? (3) How many with and without childhood ADHD are faring well, regardless of any continuing ADHD symptoms, across the remaining outcome domains?

Method

Participants

As described in more detail by Hinshaw (2002b), at baseline, girls with ADHD and comparison girls were recruited through pediatricians, schools, and direct advertisement; the clinical sample was also recruited through mental health centers. 709 interested and potentially eligible families responded by phone. 405 returned mailed parent and teacher questionnaire packets. 278 met initial screening criteria and were invited for clinic evaluations including individual testing of the child and structured parent (usually mother) interviews about the child's symptoms and impairment. Preliminary rating scale criteria were set with liberal, sex-specific thresholds in order to prevent premature exclusion of potentially eligible girls, but final study entry depended on meeting full criteria for ADHD through the parent-administered Diagnostic Interview Schedule for Children, 4th ed. (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Common comorbidities were allowed (63% of girls with ADHD also had oppositional defiant disorder [ODD], 21% had conduct disorder [CD], 27% had an anxiety disorder, 8% had a depressive disorder, 12% had reading disorder).

Comparison girls were recruited, screened, and assessed exactly as were the girls in the ADHD sample. However, comparison girls could not meet diagnostic criteria for ADHD and were selected to match the ADHD sample at a group level with respect to age and ethnicity. Exclusion criteria were mental retardation, evidence of psychosis or overt neurological disorder, lack of English spoken in the home, and medical problems prohibiting summer camp participation.

Girls with ADHD and comparison girls were intermixed for all summer program activities. Ultimately, 79 girls participated in a 5-week naturalistic summer camp program in 1997, 77 in 1998, and 72 in 1999. At baseline (1997 to 1999), these 228 girls were 6 to 12 years of age. Ninety-three were diagnosed with ADHD-combined type, 47 with ADHD-inattentive type, and 88 were without an ADHD diagnosis. The sample was ethnically diverse (53% White, 27% African-American, 11% Latina, 9% Asian-American). The average family income was \$50,000 to \$60,000, with 13.6% receiving public assistance. On average, mothers had completed "some college" on our ordinal scale. We found no ADHD versus comparison group differences on level of maternal education, family income, child race, or child age.

Approximately five years later, follow-up evaluations were performed on 209 of the 228 participants (92%), who ranged in age from 11.3–18.2 years ($M = 14.2$ years). Reasons for non-participation included (a) family lost to all tracking efforts ($n = 4$), (b) refusal to participate ($n = 5$), and (c) family contacted but scheduling of assessments not possible ($n = 10$). Additionally, two girls did not provide parent-reported DISC-IV data and three did not provide school achievement data at follow-up. As a result, the final samples for this report are 207 of the original 228 girls when domains were considered individually, and 204 when domains were considered concomitantly. Comparison of the retained sample ($n=207$) versus those lost to attrition ($n=21$) revealed no statistically significant differences for 29 of 31 baseline demographic and psychiatric variables. Significant differences were found on teacher-reported inattention and internalizing scores -- those lost to attrition had higher baseline scores, with medium effect sizes for each. The summer camps and follow-up assessments received full approval of the UC Berkeley Committee for the Protection of Human Subjects.

Procedures

The participants described in Hinshaw (2002b) were invited to participate in a prospective follow-up investigation during the academic year between four and five years following summer camp (i.e., baseline) participation. Evaluations spanned two half-day, clinic-based assessments. In several cases for which clinic participation was not possible, home visits or telephone interviews were performed. Priority was placed on obtaining multi-source, multi-informant data regarding symptoms and functional impairments. Follow-up assessment staff comprised highly trained, B.A.-level research assistants or graduate students in clinical psychology. Whereas responses to interview questions and medication status could suggest ADHD, (a) some measures involved objective variables (e.g., academic testing; computerized structured interviews), and (b) diagnostic status did change for some participants at follow-up. Thus, we do not believe that our data are biased by any breaking of blinds.

Measures

From an extensive battery, we chose the following measures because (a) they reflected our adolescent outcomes of interest, (b) they represented multiple data collection methods (structured interview, rating scale, standardized test) from multiple informants (parents and teachers), and (c) these or highly similar measures were available in Lee et al. (2008). Note that 55% of the ADHD sample had been receiving psychotropic medication within the year prior to follow-up assessment; for them, parents were asked to report with respect to the girls' status while not receiving stimulant medications.

Diagnostic Interview Schedule for Children-4th ed. (DISC-IV; Shaffer et al., 2000)—This is a well-validated, highly-structured diagnostic interview yielding both categorical diagnoses and symptom counts for the major disorders in the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV; American Psychiatric Association, 2000). At baseline, the DISC-IV was used to generate psychiatric diagnoses. Note that the DISC-IV scoring algorithms include duration and impairment criteria.

At follow-up, the computerized version was administered to parents and was used to generate symptom counts as follows: to index inattention, hyperactivity-impulsivity, and both CD and ODD symptoms, we tallied the number of symptoms endorsed. However, given the lack of perfect correspondence at the variable level between the DISC-IV interview and the DSM-IV symptom criteria for the internalizing disorders, a hand-tallied scoring approach was not possible. Instead, for our measure of anxiety and depression symptoms we totaled the symptom counts for major depressive episode, generalized anxiety disorder, social phobia, obsessive-compulsive disorder, panic, and posttraumatic stress disorder that were generated using the SAS scoring program, Version L, provided by the authors of the computerized DISC-IV interview.

Dishion Social Acceptance Scale (Dishion, 1990)—This is a 3-item, teacher-completed measure of the proportion of peers who accept, reject, and ignore the adolescent in question, with each item rated on a 5-point metric. Dishion reported moderately strong correlations between these items and peer-derived sociometric indicators. In order to follow the procedures of Lee et al. (2008), we derived a widely-used and well-validated negative social preference score from these ratings (see Coie, Dodge, & Coppotelli, 1982; Lahey, Pelham, Loney, Kipp, Ehrhardt et al., 2004; Sandstrom & Cillessen, 2003) by subtracting the “rejected” from the “accepted” raw scores and reverse scoring the difference.

Social Skills Rating System (SSRS; Gresham & Elliott, 1990)—We administered this measure to teachers and parents, and for each informant we averaged the 30 items tapping skill domains (cooperation, self-control, and assertiveness) to constitute the Total Social Skills

subscale, which is internally consistent ($\alpha = .91$ for parent report and $.95$ for teacher report). These scores possess favorable psychometrics with respect to differentiating clinical from control samples (see Hinshaw, March, Abikoff, Arnold, Cantwell, Conners, et al., 1997). We analyzed primarily teacher data. In order to preserve statistical power, parent data, which were moderately correlated with teacher data ($r = .44$, $p < .001$, $n = 150$), were substituted for the 27% of cases missing teacher SSRS data (Lee et al. [2008] obtained similar rates of missing teacher data). In other words, if teacher data were missing, we used parent data instead.

In support of this procedure, we compared those with and without teacher SSRS data at follow-up on 45 baseline demographic, psychiatric, neuropsychological, achievement, and family functioning variables, and found a statistically significant difference on only one, family income: participants with missing teacher data at follow-up came from families whose average income was somewhat lower than those not missing teacher data, $d = .4$. Although given the number of tests run this one significant comparison may have been a chance finding, we are left to conclude that if anything, substituting missing teacher data in order to employ the complete follow-up sample in our analyses did not compromise the generalizability of findings, and may have enhanced it. Furthermore, we conducted analyses regarding rates of PA on the subsample with teacher data at follow-up and results were virtually identical to those we present from the total sample that includes cases in which parent data were substituted for missing teacher data.¹ Nevertheless, because the teacher and parent means were slightly different ($t_{149} = 3.69$, $p < .001$, $d = .32$), we computed and applied thresholds (see below) for PA separately for cases with parent versus teacher SSRS data.

Swanson, Nolan, and Pelham Rating Scale-4th ed. (SNAP-IV; Swanson, 1992)—

This rating scale includes a dimensionalized checklist of the nine DSM-IV items for inattention, the nine items for HI, and the eight items for ODD, each scored on a 0 (“not at all”) to 3 (“very much”) metric. It has been used extensively in ADHD assessment and treatment research (e.g., MTA Cooperative Group, 1999). In this article we used only teacher data and scored each symptom as present (a score of 2 or 3, i.e., “pretty much” or “very much”) or absent (a score of 1 or 0, i.e., “just a little” or “not at all”). We tallied symptoms by domain, resulting in total teacher-reported symptom counts for inattention, HI, and ODD.

Wechsler Individual Achievement Test (WIAT; Wechsler, 1992)—We administered the Basic Reading and Math Reasoning subtests of the WIAT. The WIAT is a psychometrically sound, widely used test of academic achievement. Test-retest reliabilities in the standardization sample for the Reading and Math scores range from .85 to .92 (Wechsler, 1992).

Treatment status—Three dichotomous treatment-status variables were coded from an extensive background information questionnaire, which included medication-related questions, administered to primary caregivers (mostly mothers) about their daughters as part of the follow-up assessment: (1) took a psychotropic medication within the year prior to the follow-up visit, (2) used school-based educational interventions in the period since baseline, and (3) used psychological interventions (i.e., individual, group, or family therapy) outside of school in the period since baseline. Codes were “1” (yes) or “0” (no) for each of these variables.

Establishing Thresholds for Positive Adjustment in Each Domain

Guidelines for establishing a person-centered measure of PA are not available (for general considerations, see Bergman & Magnusson, 1997). However, Lee et al. (2008) provide an excellent example of one such measurement strategy; we adopted the same conceptualization and operational definition as theirs. Conceptually, we defined PA as performing within the

¹Further information regarding these analyses is available from the author upon request.

normal range of the typical (not-at-risk) adolescent, but not necessarily performing at or better than the average level of not-at-risk adolescents. Specifically, in order to avoid overly stringent thresholds for PA, we used cut-offs at the low end of the normal range for social skills and school achievement variables (which are scored positively) and the high end of the normal range for symptom and negative social preference variables (which are scored negatively). It was our intention that the selected cut-offs within each domain would correspond to the level at which an adolescent would be viewed as not requiring treatment for difficulties in that domain. In order to empirically determine these cut-offs, we began by examining means and standard deviations for each measure obtained at follow-up during adolescence by diagnostic status, which are presented in Table 1. Across all measures, the girls with ADHD showed increased problems or lower competence than comparison girls (all $ps < .001$), and more variance in their scores than the comparison group (all differences between variances were highly significant, except for math achievement).

In each domain except school achievement, we adopted the Jacobson and Truax (1991) recommendation that the threshold for clinically significant recovery during psychotherapy treatment be set at the midpoint between functional and dysfunctional populations. Because their argument for using such a midpoint to index PA is persuasive, we followed it conceptually to establish PA thresholds. Jacobson and colleagues (Jacobson & Truax, 1991; Jacobson, Roberts, Berns, & McGlinchey, 1999) offer various specific formulas for establishing such midpoints. We established specific cut-points by averaging the mean of the ADHD and the mean of the comparison group, as did Lee et al. (2008). Specifically, a child was considered positively adjusted on a particular measure if her score was at (or below) the mean score of the ADHD and comparison means on symptom measures and negative social preferences measures, or at (or above) the mean score of the ADHD and comparison means on the social skills measure. For example, during adolescence the mean number of conduct problem symptoms in our comparison group was 1.01, and in our childhood ADHD group $M = 4.57$. Therefore, we considered an adolescent positively adjusted in the externalizing domain if she had three or fewer conduct problem symptoms (to be conservative in terms of minimizing the exclusion of girls with ADHD from the positively adjusted group, the mean of $[1.01 + 4.57]/2 = 2.79$ was rounded up to 3). For the school achievement domain we used a standardized threshold, that is, a score greater than or equal to 85 (one standard deviation below national norms) on both reading and math subscales. The selected thresholds (i.e., cut-points) for each measure in each domain are presented in Table 2. To meet within-domain criteria for PA, the threshold for each measure in that domain had to be surpassed. Thus, we essentially used an “and” algorithm for combining multi-informant information.

Data Analyses

Initial analyses involved investigation of missing data. We then used frequency counts to calculate rates of PA separately within our ADHD and comparison groups, both within individual domains and then simultaneously across domains. Differences in rates of PA across groups (ADHD versus comparison) were examined using eight two-tailed Pearson chi-squared tests with accompanying odds ratios: (a) six for within-domain comparisons, and (b) two for across-domain comparisons that either included or did not include the ADHD domain. Because we employed a relatively small number of conservative two-tailed tests, we did not adjust the alpha level, which was set at .05 throughout. Using two-tailed Pearson chi-squared tests, we also conducted post hoc analyses involving (a) rates of PA when it was defined without reference to symptoms (i.e., peer acceptance, social skills, and school achievement only); (b) associations between PA and ADHD subtype (ADHD-combined versus ADHD-inattentive), cohort (i.e., 1997 versus 1998 versus 1999), and treatment status; and (c) change over time in rates of PA.

Results

Among the 207 cases assessed at follow-up, no data were missing in four of the six outcome domains. Three girls with ADHD were missing WIAT scores and we did not substitute values for these missing data. Because teacher report on the Dishion Social Acceptance Scale was available for only 152 of the 207 (73%) cases, for 55 cases we imputed a negative social preference score using parent-reported CD/ODD symptoms. The association between externalizing symptoms and peer rejection is widely-acknowledged, and externalizing problems may be causally related to peer rejection in childhood (Pedersen, Vitaro, Barker, & Borge, 2007; Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999), although the causal pathway between these variables is likely bidirectional. Furthermore, parent-reported CD/ODD symptoms was the only variable tested in a stepwise regression that predicted significant variance in negative social preference scores among the 152 cases with valid Dishion scale data ($R^2 = .18$). In order to check the validity of our data imputation strategy, we computed results among only those cases with teacher-reported peer data, and they were virtually identical to those we present below which include cases with imputed data. Furthermore, as explained above, analyses addressing whether teacher data were missing at random suggest that substituting missing teacher data in order to employ the complete follow-up sample in our analyses did not compromise the generalizability of findings, and may have enhanced it.¹ Thus, our final n for within-domain analyses (except for school achievement) was 207 and our final n for across-domain analyses was 204.

After establishing thresholds for PA on each measure, as described above, we counted the number of girls whose scores surpassed the individual domain-level thresholds for PA, with results presented in Table 2. Among girls with childhood ADHD, a minority (19.8%) was essentially free of ADHD symptoms by adolescence, compared to 86.4% of the comparison girls. Fewer than half of the ADHD sample were below our threshold for externalizing problems (42.1%) or internalizing problems (49.2%), compared to 91.3% and 85.2% of the comparison girls, respectively. Similarly, 40.5% of the ADHD girls demonstrated adequate social skills during adolescence, whereas more than twice as many (82.7%) of the comparison girls did. Over half of the girls with childhood ADHD (61.1%) received adequate teacher-reported social preference ratings, whereas 87.7% of the comparison girls did. Sixty-five percent of the girls with childhood ADHD were achieving adequately in math and reading during adolescence, compared to 96.3% of the comparison girls. In each of the outcome domains, the rate of PA among ADHD girls was notably lower than the rate of PA among comparison girls (all $ps < .001$). Effect sizes in each individual domain indicate that for girls with childhood ADHD the odds of maladjustment (failing to show PA) during adolescence were between 4 and 25 times greater than the odds of maladjustment among comparison girls.

Information in Table 3 addresses our primary question of *overall* rates of across-domain PA, by which we mean that a given participant was free of significant symptomatology and functional impairment in most domains. Overall PA was operationalized as meeting criteria for PA in at least five of the six domains. Our rationale was two-fold: First, it seemed sensible that competence in most domains, but not necessarily every single one, would be required for an adolescent to be considered well-adjusted *overall*; and second, we wished to be consistent with the procedures of Lee et al. (2008) in which they defined well-adjusted overall as surpassing thresholds for minimum competence in at least all but one domain. Similar to Lee et al. (2008), we found a very large association ($t_{202} = 12.47, p < .001, d = 1.7$) between overall impairment (in our case, measured using the Columbia Impairment Scale) and meeting PA criteria in four or fewer domains versus at least five of the six domains.

Only 16.4% of the girls with childhood ADHD were positively adjusted during adolescence, utilizing this criterion, compared to 86.4% of the comparison girls. This difference was highly

significant ($X^2_{1,204} = 97.51, p < .001$), with an odds ratio of 32.7 (95% CI = 14.8 to 72.6). Thus, for girls with childhood ADHD, the odds of failing to meet overall PA criteria were 32 times greater than the odds for comparison girls. Of the 20 girls with childhood ADHD who did meet criteria for overall PA, five surpassed PA criteria in all six domains. Of the 15 remaining, the number failing to meet PA criteria in each domain was as follows: five in the ADHD domain, one in the externalizing domain, four in the internalizing domain, one each in the social skills and peer acceptance domains, and three in the school achievement domain.

We then examined overall PA in the domains other than ADHD symptoms, defined as meeting PA criteria in four of the five remaining domains. As expected, more girls with childhood ADHD demonstrated PA with this more lenient criterion, but the difference between this percentage (28.5%) and that for the comparison girls (87.7%) was still highly significant ($X^2_{1,204} = 68.57, p < .001$), with an odds ratio of 17.9 (95% CI = 8.3 to 38.5).

Post hoc, when we operationalized PA using a subset of domains reflecting impairment only (the social skills, peer acceptance, school achievement domains), the percentages meeting PA criteria in all three of these domains, 22.2% in the ADHD group and 81.5% in the comparison group ($X^2_{1,204} = 69.77, p < .001$; odds ratio = 15.6, 95% CI = 7.7 to 31.7), were similar to the primary results reported above. Thus, independent of core and comorbid psychiatric symptoms, during adolescence the majority of girls with childhood ADHD were notably more impaired than comparison girls in terms of social and academic functioning.

No differences existed in rates of PA among girls with ADHD when cohort differences (i.e., year of ascertainment: 1997 versus 1998 versus 1999) were examined ($X^2_{1,123} = .53, p = .766$; odds ratio = 1.2, 95% CI = .7 to 2.2). The association between childhood ADHD type (inattentive versus combined) and overall PA was marginally significant ($X^2_{1,123} = 3.08, p = .079$; odds ratio = .3, 95% CI = 0.1 to 1.2), with 7.7% of girls with inattentive-type ADHD during childhood showing PA during adolescence, versus 20.2% of girls with combined-type ADHD. Regarding treatment status among girls with ADHD, use of educational intervention services at school since baseline was not related to PA. However, having received psychotropic medication in the year prior to the follow-up visit ($X^2_{1,119} = 3.73, p = .053$; odds ratio = 2.6, 95% CI = 1.0 to 7.2) and having received psychological services outside of school since baseline ($X^2_{1,119} = 20.21, p < .001$; odds ratio = 9.9, 95% CI = 3.2 to 30.6) were *negatively* associated with rates of PA. In other words, among girls with childhood diagnoses of ADHD, use of psychological treatments (but not educational services) and medication treatments (to a marginally-significant degree) predicted *lower* rates of overall PA at follow-up.

We assessed change over time in PA status using an overall adjustment measure disregarding the ADHD domain, because at baseline, by definition, all girls with ADHD did not meet positive adjustment criteria in that domain and all comparison girls did. Consequently, we used baseline data to create an overall adjustment measure reflecting functioning in five domains (externalizing symptoms, internalizing symptoms, peer acceptance, social skills, and school achievement), which was highly comparable to the analogous measure we employed at follow-up. Specifically, we defined thresholds for PA at baseline within each domain using the average of the ADHD and comparison group means. We then examined change over time in across-domain PA (disregarding ADHD status) as a function of baseline diagnostic group. At baseline, only 17.1% of the ADHD girls met PA criteria in four of five domains compared to 82.9% of the comparison girls. By adolescence, these figures were 28.5% and 87.7%, respectively. The baseline to follow-up change in PA frequency among comparison girls was not significant, but the change for girls with ADHD (17.1% vs. 28.5%) was significant ($X^2_{1,123} = 10.24, p = .001$; odds ratio = 0.2, 95% CI = 0.1 to 0.6). This finding suggests that girls with ADHD were more likely to show improvement over time, in terms of moving to the positively adjusted category,

than were comparison girls. However, despite this relative improvement, their rate of PA at follow-up (28.5%) was still far lower than the rate for comparison girls (87.7%).

Discussion

We adopted a person-centered analytic approach to address rates of across-domain PA during adolescence among a prospectively followed sample of 140 girls with childhood diagnoses of ADHD and 88 age- and ethnicity-matched comparison girls. Results indicate that between 19.8% and 65.0% of the girls with ADHD were positively adjusted within each of six individual domains, and in each the percentage of positively adjusted ADHD girls was much lower – both in terms of statistical significance and large effect – size than the same percentage of comparison girls. Furthermore, only 16.4% of the ADHD girls were positively adjusted in at least five of the six domains, compared to 86.4% of the comparison girls. Even when psychiatric symptoms were excluded from the definition of PA, rates among the ADHD and comparison girls were quite different. Most girls with ADHD did not “grow out of” their ADHD and its related impairments, although a notable minority was faring reasonably well during adolescence. Thus, our findings are crucial in documenting that girls with ADHD show rates of PA during adolescence that are similar to those of boys (Lee et al., 2008).

Our results, which suggest continuing symptoms and impairments across domains for the majority of girls with ADHD, are consistent with similar prospective studies employing variable-based analyses within domains (e.g., Barkley et al., 2002; Biederman et al., 1996b; Satterfield et al., 1994; Weiss & Hechtman, 1993). Taken together, the present investigation and that of Lee et al. (2008) provide strong evidence for the association between childhood ADHD and later negative outcomes. Indeed, because all of the participants in the current sample were female, our findings are noteworthy in suggesting longstanding impairments for girls with ADHD.

Regarding comparison with Lee et al. (2008), the methodologies used in this paper and theirs were quite similar. We examined similarly-sized and ethnically-mixed samples followed prospectively into adolescence. Outcome domains assessed and analytic strategies employed were closely related (e.g., we included school achievement as a primary measure, whereas Lee et al. [2008] used it in secondary analyses). Measures administered were highly similar. The notable methodological differences were as follows: Our sample was all female and primarily community based, whereas that of Lee et al. (2008) was predominantly male (82%) and most of their participants with ADHD were identified among children who were clinic referred. Furthermore, their children were diagnosed at ages 4 to 6 and their design featured yearly follow-up, with data from the 7- and 8-year follow-ups reported in their paper. Our girls were first seen when they were 6- to 12-years-old and then followed-up once 4 to 5 years later.

We compare our results primarily to the Wave 8 findings of Lee et al. (2008), given that the age of their participants (12 to 14) at that wave encompasses early adolescence. In both ADHD samples, PA in the externalizing domain was less likely than in the internalizing domain, and PA rates in these domains, as well as in the social skills and peer domains, did not differ between the two ADHD samples. Equivalence in the externalizing domain is contrasted with meta-analytic results suggesting that impairment in the externalizing domain is greater for boys than girls (Gaub & Carlson, 1997; Gershon, 2002). Furthermore, the equivalence of the ADHD samples in the externalizing, social skills, and peer domains occurred despite differences in PA rates in the present comparison sample versus that of Lee et al. (2008): for externalizing: 91.3% vs. 79.4%, $X^2_{1,222} = 4.16, p = .041$; for social skills: 82.7% vs. 69.0%, $X^2_{1,222} = 4.84, p = .028$; for peer acceptance: 87.7% vs. 73.8%, $X^2_{1,222} = 5.74, p = .017$. Low rates of PA occur for boys and girls with ADHD, despite our finding that among young adolescents without a prior history of ADHD, girls appear to show somewhat higher rates of PA than do boys. In

accord with findings that ADHD among girls yields overall impairment comparable to that among boys (Gaub & Carlson, 1997; Gershon, 2002), the negative consequences of childhood ADHD for girls were equivalent to those in the primarily-male Lee et al. (2008) ADHD sample.

Within-domain differences between our ADHD sample and theirs occurred in the domains of ADHD symptoms and school achievement. In the former, the percent with positive adjustment in our sample was 19.8%, almost twice that among the Lee et al. (2008) ADHD sample (10.4%; $X^2_{1,222} = 3.64, p = .056$), probably because the latter was predominantly male and mostly clinic-referred, with many participants younger than the girls in our sample. Greater academic impairment among the ADHD girls in our sample (only 65.0% positively adjusted) versus the Lee et al. (2008) ADHD sample (86.5%; $X^2_{1,219} = 13.00, p < .001$) corresponds with meta-analytic findings of greater academic and intellectual impairments among girls versus boys with ADHD (Gaub & Carlson, 1997; Gershon, 2002).

Importantly, rates of overall PA across domains in the two ADHD samples were quite similar and differences were not statistically significant. As was true in the Lee et al. (2008) ADHD sample, in which 14.6% were positively adjusted overall during adolescence, about one in six (16.4%) of the girls with ADHD in our sample were considered positively adjusted overall.

Our post hoc analyses primarily involved exploration of diagnostic and treatment variables possibly associated with membership in the positively adjusted group among the girls with ADHD. From the perspective that combined-type ADHD is more severe or “worse” than the inattentive type, our marginally significant finding that girls with inattentive-type ADHD showed somewhat *lower* rates of PA during adolescence than girls with childhood diagnoses of combined-type ADHD may be surprising. However, accumulating evidence suggests that the inattentive subtype is associated with significant impairment and is less likely than the combined subtype to naturally remit with respect to symptomatology over time (Hart et al., 1995; Hinshaw et al., 2006). Similarly, our findings that medication use and psychological treatments (but not educational interventions) were associated with lower rates of PA among the girls with ADHD may seem counterintuitive. However, we believe that the intervention selection bias accounts for these seemingly paradoxical relations (see Larzelere, Kuhn, & Johnson, 2004). Among girls with ADHD, initially poor adjustment probably served to explain both their use of medication and psychological services and their absence from the positively-adjusted group at follow-up. Similar patterns were observed in Lee et al. (2008).

Implications for Research, Policy, and Practice

We have demonstrated a method for identifying groups of competent children among those at risk (and not at risk) for poor developmental outcome. Importantly, rather than documenting average-level group differences on outcome variables measured using continuous scales, we have grouped children according to their attainment in multiple domains simultaneously. Our use of multi-informant/method data to construct a unified, clinically meaningful outcome measure is important because it identifies and describes children who are competent (or not) in important developmental domains. Such person-centered approaches to assessing outcome are infrequently employed and could be useful in studies of competence versus maladjustment among at-risk children.

Our results and those of Lee et al. (2008) speak to the chronic nature of the symptoms and particularly the impairments associated with childhood ADHD for girls and boys. Despite typical decreases in hyperactivity and impulsivity by adolescence (Hart et al., 1995; Hinshaw et al., 2006), the majority of children with ADHD in each sample were faring poorly in at least two important domains during adolescence, and many were doing poorly in multiple domains. There is, however, a minority who despite their childhood ADHD was faring reasonably well during early- to mid-adolescence. Furthermore, girls with ADHD were more likely to move to

the positively adjusted group by follow-up than were comparison girls. Although this latter finding may simply reflect regression to the mean, it also supports the notion of recovery by adolescence among some girls with ADHD. Thus, it is important for providers to remember that a childhood diagnosis of ADHD portends continuing trouble, but such outcomes are not inevitable.

Our analyses were primarily descriptive, not explanatory. A critical next step will be to identify predictors of PA that may aid in the early identification of those least likely to “grow out of” their ADHD and therefore most in need of treatment. Predictor identification might also help to explain varying outcomes for children with ADHD and may inform interventions. For example, if specific parenting strategies were associated with increased PA rates, interventions aimed to promote that strategy might be beneficial. Our results also raise a question as to whether ultimately well-adjusted children in fact have a different form of ADHD from those whose symptoms and impairments persist. Further investigation of this issue is warranted.

Limitations and Conclusions

The primary limitation of these analyses is that most thresholds used to determine PA were empirically rather than theoretically derived. Furthermore, it should be noted that Jacobson and Truax (1991) propose guidelines for their method including the use of normative data and normally-distributed data. In psychopathology research, normative data are often not available and normal distributions are not always obtained (e.g., distributions of symptom counts are frequently skewed). We do not contend that our specific thresholds would be valid in other samples, although ultimately the validity of our calculation method, which we believe is high, is as important as the particular values for and psychometric properties of the specific thresholds. Alternative thresholds might have produced different PA rates. For example, if we had defined PA as performance at or better than the comparison group mean, rates of PA would have been much lower. If we had considered PA rates earlier or later in development, or if we had examined PA at multiple time points (as did Lee et al., 2008), our results would have been somewhat different.

We focused on a number of developmentally relevant outcome domains, but others (e.g., romantic relationships, substance use) were not included because of the lack of maturation into late adolescence for all but a minority of our sample by the follow-up. However, when we employed a subset of domains that reflected impairment only (the social skills, peer acceptance, school achievement domains), the percentages meeting PA criteria in all three of these domains (22.2% in the ADHD group and 81.5% in the comparison group) were highly similar to the primary results reported herein. Thus, even independent of core and comorbid psychiatric symptoms, most girls with ADHD are notably worse off than comparison girls in terms of social and academic functioning.

Additionally, some shared source variance (mothers reported on diagnostic status at baseline and reported on symptom counts at follow-up) may have influenced our results, but this effect was similar in our girls with ADHD and our comparison girls. It would have been highly preferable to obtain a social preference measure from the adolescents' peers. However, because adolescents move from classroom to classroom throughout their day, it would have been virtually impossible to define peer groups from which to obtain a sociometric measure of peer acceptance for each participant. Finally, although we believe our sample adequately represents the population of school-aged girls with ADHD in the San Francisco Bay Area, unknown selection effects could limit the generalizability of the results.

Overall, findings clearly lead to the conclusion that most children do not “grow out of” their ADHD, although a notable minority demonstrates PA during adolescence. Indeed, despite somewhat differing PA thresholds across samples, the PA rates during adolescence both within

and across domains were generally highly similar among the children with ADHD in this and the Lee et al. (2008) article. Although certain symptoms may improve, most girls diagnosed with ADHD during childhood still showed considerable across-domain maladjustment and impairment during adolescence.

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Table 1

Means and standard deviations on adolescent positive adjustment measures

Domain/Measure	Childhood ADHD (n=126)		Comparison (n=81)	
	X	(sh)	X	(sd)
ADHD	Parent DISC-IV Inattention sxs	5.2 (3.1)	0.7	(1.5)
	Parent DISC-IV HI sxs	3.1 (2.9)	0.0	(0.3)
	Teacher SNAP-IV Inattention sxs	3.3 (3.3)	0.6	(1.5)
	Teacher SNAP-IV HI sxs	1.2 (2.2)	0.1	(0.5)
Externalizing	Teacher SNAP-IV ODD sxs	1.1 (2.0)	0.2	(0.9)
	Parent DISC-IV CD/ODD sxs	4.6 (3.8)	1.0	(1.8)
Internalizing	Parent DISC-IV depression/anxiety sxs	12.4 (9.0)	4.8	(5.9)
Social Skills	Teacher SSRS Total subscale mean	1.3 (0.4)	1.6	(0.3)
Peers	Dishion Negative Social Preference	2.3 (2.1)	1.0	(1.1)
Achievement	WIAT math subscale ^a	94.2 (16.4)	112.9	(14.2)
	WIAT reading subscale ^a	98.0 (12.0)	107.7	(8.2)

Note. ADHD = attention-deficit/hyperactivity disorder; DISC-IV = Diagnostic Interview Schedule for Children, version IV; sxs = symptoms; HI = hyperactivity/impulsivity; SNAP-IV = Swanson, Nolan, and Pelham, version IV; CD/ODD = conduct disorder/oppositional defiant disorder; SSRS = Social Skills Rating Scale; WIAT = Wechsler Individual Achievement Test.

^aBased on ADHD group n = 123.

Table 2
Frequency counts of girls meeting positive adjustment criteria during adolescence in separate domains

Domain/Measure ^a	Childhood ADHD			Comparison		
	threshold	n	%	n	%	OR (95% CI)
ADHD	Parent DISC-IV Inattention sxss	≤ 3	25	19.8	70	86.4
	Parent DISC-IV HI sxss	≤ 2				25.7 (11.9 to 55.6)
	Teacher SNAP-IV Inattention sxss	≤ 2				88.01***
	Teacher SNAP-IV HI sxss	≤ 1				
Externalizing	Teacher SNAP-IV ODD sxss	≤ 1	53	42.1	73	91.3
	Parent DISC-IV CD/ODD sxss	≤ 3				12.6 (5.6 to 28.3)
Internalizing	Parent DISC-IV depression/anxiety sxss	≤ 9	62	49.2	69	85.2
	Teacher SSRS Total subscale mean ^b	≥ 1.4	51	40.5	67	82.7
Social Skills	Dishion Negative Social Preference	≤ 2	77	61.1	71	87.7
	WIAT math subscale ^c	≥ 85	80	65.0	78	96.3
Achievement	WIAT reading subscale ^c	≥ 85				14.0 (4.2 to 46.9)

Note. OR = odds ratio; CI = confidence interval; ADHD = attention-deficit/hyperactivity disorder; DISC-IV = Diagnostic Interview Schedule for Children, version IV; sxss = symptoms; HI = hyperactivity/impulsivity; SNAP-IV = Swanson, Nolan, and Pelham, version IV; CD/ODD = conduct disorder/oppositional defiant disorder; SSRS = Social Skills Rating Scale; WIAT = Wechsler Individual Achievement Test.

 $p < .001$

^aThresholds for each measure within a domain needed to be passed for positive adjustment criteria in that domain to be met.

^bParent SSRS total score was used in the 27% percent of cases missing the teacher score. [threshold in these cases

^cBased on ADHD group n = 123.

Table 3
Frequency counts of girls meeting positive adjustment criteria during adolescence in up to six domains

PA criteria met in:	Childhood ADHD (n=123)		Comparison (n=81)	
	n	%	n	%
0	7	5.7	0	0.0
≥ 1	116	94.3	81	100.0
≥ 2	95	77.2	79	97.5
≥ 3	64	52.0	75	92.6
≥ 4	41	33.3	75	92.6
5	20	16.4	70	86.4
6	5	4.0	48	59.3

Note. ADHD = attention-deficit/hyperactivity disorder. PA = positive adjustment.