

Young Adult Educational and Vocational Outcomes of Children Diagnosed with ADHD

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Abstract Decreased success at work and educational attainment by adulthood are of concern for children with ADHD given their widely documented academic difficulties; however there are few studies that have examined this empirically and even fewer that have studied predictors and individual variability of these outcomes. The current study compares young adults with and without a childhood diagnosis of ADHD on educational and occupational outcomes and the predictors of these outcomes. Participants were from the Pittsburgh ADHD Longitudinal Study (PALS), a prospective study with yearly data collection. Significant group differences were found for nearly all variables such that educational and occupational attainment was lower for adults with compared to adults without histories of childhood ADHD. Despite the mean difference, educational functioning was wide-ranging. High school academic achievement significantly predicted enrollment in post-high school education and academic and disciplinary problems mediated the relationship between childhood ADHD and post-high school education. Interestingly, ADHD diagnosis and disciplinary problems negatively predicted oc-

cupational status while enrollment in post-high school education was a positive predictor. Job loss was positively predicted by a higher rate of academic problems and diagnosis of ADHD. This study supports the need for interventions that target the child and adolescent predictors of later educational and occupational outcomes in addition to continuing treatment of ADHD in young adulthood targeting developmentally appropriate milestones, such as completing post-high school education and gaining and maintaining stable employment.

Keywords ADHD · Young adult · Education · Employment · Longitudinal outcomes

Prospective longitudinal studies that have followed children with Attention Deficit Hyperactivity Disorder (ADHD) into adulthood find evidence of continuing impairment in multiple domains of functioning (Barkley et al. 1990; Barkley et al. 2006). Decreased success at work and educational attainment in young adulthood are of concern given the widely documented academic difficulties experienced by children with ADHD (Frazier et al. 2007). Moreover, the time after high school is an important transition period marked by an increase in options available to young adults with a decrease in formal structure (Schulenberg et al. 2004). Given the importance of this period, the current study explores the factors that influence educational and occupational success for young adults with a childhood history of ADHD.

It is well established that children diagnosed with ADHD suffer from problems in daily life functioning, including difficulties in school. School-related difficulties in the primary school years include disruptive classroom behavior and academic underperformance, such as poor scores on standardized achievement tests (DuPaul 2007; Frazier et al. 2007). Although there are few studies of adolescents

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with ADHD, it appears that behavioral and academic difficulties in elementary school often continue unabated and may even worsen in middle and high school (Kent et al. 2011). Adolescents with ADHD have lower grades and class placement, are more likely to be suspended, be expelled, fail classes, have higher rates of absenteeism, and are less likely to graduate high school than adolescents without ADHD (Barbarese et al. 2007; Fischer et al. 1990; Hechtman and Weiss 1983; Kent et al. 2011; Mannuzza et al. 1993; Molina et al. 2009; Robb, et al. 2011). Longitudinal studies show that the association between ADHD and academic achievement in youth is mediated by variables reflecting classroom performance, homework management, and behavior problems (Langberg et al. 2011; Rapport et al. 1999). Given the frequency, severity, and persistence of academic and behavioral problems of youth with ADHD, it might be expected that they will continue to have difficulties when they pursue employment and/or higher education. There are only a handful of studies that report either of these post-high school outcomes for individuals with childhood ADHD.

Research suggests that children with ADHD are less likely to pursue education after high school, although findings are mixed and definitions of higher education differ depending on the study. One study suggests that young adults with ADHD are more likely to be unemployed or working compared to young adults without ADHD, who tend to enroll in college during their early twenties (Barkley et al. 2006). In contrast, Paternite and colleagues (1999) reported that 55 % of 21 to 23 year olds with childhood ADHD pursued post-secondary education at some point during follow-up (compared to 21 % reported by Barkley and colleagues). However, post-secondary education included junior college, four-year college, trade school, and business school, all of which differ in their career placement opportunities and admission requirements. Group differences in level of education attained may have been masked by the combined analysis, suggesting a need for more refined examination of young adults' educational attainment. For those who enrolled in post-high school education, young adults with childhood ADHD completed fewer years of college than a comparison group (Mannuzza et al. 1997; Barkley et al. 2008). Examining differential enrollment in college and its relation to occupational attainment may uncover the young-adult achievement trajectories for those diagnosed with ADHD.

There is some evidence that young adults with childhood ADHD attain lower status employment compared to their peers without ADHD. Two prospective longitudinal studies show that young adults with childhood ADHD had lower ranked occupations than a comparison group in their mid-late twenties (Mannuzza et al. 1993; Barkley et al. 2008). Alternatively, Weiss and colleagues (1979) and the second cohort of the New York study (Mannuzza et al. 1997) did

not find any significant group differences of employment status as measured on the Hollingshead scale. Beyond employment status, young adults with ADHD histories may experience more unstable employment situations compared to those without ADHD. For example, when compared to their peers, young adults with ADHD changed employment frequently, obtained fewer full time occupations, and were more frequently fired (Barkley et al. 2006). Paternite, and colleagues (1999) conducted a follow-up study of boys ages 4–12 who were initially treated at a university medical clinic with behavioral intervention or pharmacotherapy. This study reported that during ages 21–23, 41 % of the boys with ADHD had been fired at least once and 26 % were unemployed at follow-up. In contrast, Mannuzza and colleagues (1997) found that only 8 % of participants with ADHD were unemployed, which was not significantly different from the control group. In light of these discrepancies, and the fact that the studies above reported on small samples that were, on average, in their early 20's and recruited long ago, an update to these results with an older, larger, sample would be beneficial. Also, because occupational rank does not fully capture the quality of employment, other variables, such as salary, duration at each place of employment, and reasons for leaving employment need to be further investigated.

Despite the poor outcomes noted above, there is evidence that a sub-group of children diagnosed with ADHD are successful after high school. A review by Hechtman (1999) found that 30 % of adults with childhood ADHD functioned as well as comparison participants, attending and completing college, and achieving high status employment. Given the individual variability in post-high school academic and vocational functioning of children with ADHD, consideration of factors that predict these outcomes may improve understanding of long-term achievement. Data from studies that have explored child and adolescent factors as predictors of adult educational and occupational outcomes in the general population suggest that behavioral and academic problems during childhood may have differential impacts on later educational and occupational success (Tanner et al. 1999; Hossler and Stage 1992). Therefore, it would be beneficial to examine whether it is the relatively immutable variables, such as the diagnosis of ADHD, or variables that may respond to intervention, such as academic and disciplinary problems, that predict adulthood occupational and educational under-achievement.

Two studies reported predictors of post-high school educational outcome for young adults diagnosed with ADHD in childhood. Paternite and colleagues (1999) did not find any significant associations between childhood predictors (symptoms and medication history) and involvement in post-high school education. In contrast, Barkley and colleagues (2008) found that childhood (hyperactivity,

behavior problems, and IQ), adolescent (math achievement, and parent reported conduct and oppositional defiant disorder symptoms), and young adult (age 21; conduct symptoms) variables predicted the number of years of education obtained by age 27. Limited conclusions can be drawn about years of education obtained by a certain age, since attending school for long periods of time can occur for both positive and negative reasons (e.g., grade retention or graduate school). Furthermore, recruitment for the previous studies occurred before 1980 and many important changes took place in the U.S. educational system after the 1980's regarding accommodations for children with ADHD. Therefore, it is important to update the literature featuring children who have had similar access to educational accommodations as children today—as these were implemented to promote achievement. The period of time after high school is a transition period into young adulthood marked by a diversity of choices, and it is important to study the choices that ADHD youth make after high school (Schulenberg et al. 2004). Examining the variables that predict enrollment in the various types of post-high school education and how this decision relates to occupational outcomes may be instructive to those providing services to youth, such as vocational counselors. Thus, the first overarching gap in the literature is the scarcity of studies that examine predictors of post-high school education achievement for children diagnosed with ADHD.

Three prospective longitudinal studies reported predictors of occupational outcomes for children diagnosed with ADHD (Paternite et al. 1999; Hechtman et al. 1984; Barkley et al. 2006). Barkley and colleagues (2008) reported that participants who had greater years of education and fewer oppositional defiant symptoms were less likely to be fired. Hechtman and colleagues (1984) showed that in young adults (ages 17–24) with childhood ADHD, hyperactivity predicted the percentage of jobs from which a participant was fired. In contrast, Paternite and colleagues (1999) did not find an association between childhood predictors and having ever been fired or with unemployment for males ages 21–23. These data suggest that there are inconsistencies regarding the prediction for being fired. Furthermore, there is an absence of studies that have examined youth predictors that lead some with an ADHD diagnosis to higher versus lower status occupations. Additionally, assessing employment from ages 17–24 limits the range of outcomes studied because it does not consider the time needed to complete a degree in higher education, which may be required for higher status occupations. In fact, the type of post-high school education attended may influence the occupational status of young adults with ADHD and may be an additional point to intervene. Relatedly, people in the 17–24 age range may still be in school (e.g. completing a bachelor's degree with a part-time job), and their em-

ployment during this stage in life may not be representative of their actual attainment. In sum, children with ADHD have varying outcomes in young adulthood, with little data describing the impact of youth behavior and school performance on later educational and occupational outcomes.

The current study used data from the Pittsburgh ADHD Longitudinal Study (PALS) to compare the educational and occupational outcomes of young adults diagnosed with ADHD in childhood to young adults who did not meet diagnostic criteria for ADHD. In addition, child and adolescent variables were examined to evaluate potential predictors of these outcomes. We hypothesized that the academic and occupational achievement of the ADHD participants would be significantly below that of the comparison group. We also hypothesized that high school under-achievement, academic, and disciplinary problems would predict educational and occupational outcomes above and beyond initial ADHD diagnosis.

Method

Participants

ADHD Group The ADHD group was recruited from a pool of 516 study-eligible participants diagnosed with DSM-III-R or DSM-IV ADHD in childhood and treated in the Summer Treatment Program (STP) at the Western Psychiatric Institute and Clinic (WPIC) in Pittsburgh, PA from 1987 to 1996. Of the 516, 493 were re-contacted an average of 8.35 years later ($SD=2.79$) to participate in annual interviews of the PALS. Of those contacted, 364 (70.5 %) enrolled in the PALS. At the first follow-up interview, the ADHD group ranged in age from 11 to 28 with 99 % falling between 11 and 25 years of age. They were admitted to the follow-up study on a rolling basis between the years 1999–2003 and completed their first follow-up interview immediately upon enrollment.

Participants in the follow-up study were compared with the eligible individuals who did not enroll on demographic (i.e., age at first treatment, race, parental education level, and marital status) and diagnostic (i.e., parent and teacher ratings of ADHD symptomatology) variables collected at baseline. Only one of 14 comparisons was statistically significant at the $p<.05$ level. Participants had a slightly lower average CD symptom rating on a four point scale as indicated by a composite of parent and teacher ratings (participants $M=0.43$, non-participants $M=0.53$). In the PALS young adult male sample (ages 18–28), 75 % of the ADHD group had elevated ADHD symptomatology and 60 % experienced clinically significant impairment in young adulthood, although only 20 % qualified for a DSM-IV-TR ADHD diagnosis (Sibley et al. 2012). As noted by previous

researchers, the DSM-IV-TR ADHD diagnostic criteria may not be fully applicable to young adults (Molina et al. 2009).

Comparison Group Comparison participants were 240 individuals without ADHD. They were recruited for the PALS from the greater Pittsburgh community between 1999 and 2001. These individuals were recruited from pediatric practices in Allegheny County (40.8 %), advertisements in local newspapers (27.5 %), local universities and colleges (20.8 %), and other methods (10.9 %) such as Pittsburgh Public Schools and word of mouth. Comparison recruitment lagged three months behind ADHD group enrollment to facilitate efforts to obtain demographic similarity (discussed below). A telephone screening interview was administered to parents of potential comparison participants to gather basic demographic characteristics, history of diagnosis or treatment for ADHD and other behavior problems, presence of exclusionary criteria as previously listed, and a checklist of ADHD symptoms. Young adults (age 18+) also provided self-report of ADHD symptoms. ADHD symptoms were counted as present if reported by either the parent or the young adult. Participants who met DSM-III-R criteria for ADHD, either currently or historically, were immediately excluded from study consideration.

If a potential comparison participant passed the initial phone screen, senior research staff members met to determine whether he/she was demographically appropriate for the study. Four demographic characteristics were examined for each potential comparison participant: 1) age, 2) gender, 3) race, and 4) parent education level. A comparison participant was deemed study-eligible if his/her enrollment increased the comparison group's demographic similarity to the ADHD group. At the end of the recruitment process, the two groups were equivalent on the four demographic variables noted above. An unsuccessful attempt was made to obtain equivalence on the proportion of parents who were married.

Total Sample At follow-up, the sample ($N=604$) was 89 % male, 82 % Caucasian, and annual income ranged from < \$20 k to >\$100 k with a median of \$55,000. Parental education ranged from high school to graduate school with the majority having attained at least partial college or technical training.

Childhood Assessment

In childhood, mean age for the ADHD group referral and diagnostic evaluation was 9.40, $SD=2.27$, and ranged from 5.00 to 16.92 years with 90 % between 5 and 12. Children with ADHD underwent an assessment including parent and teacher Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R and DSM-IV; American Psychiatric Association 1987, 1994) symptom ratings (DBD; Pelham et al. 1992)

and a semi-structured interview administered to parents by a Ph.D. level clinician. The interview consisted of the DSM-III-R or DSM-IV descriptors for ADHD, ODD, and CD with supplemental questions regarding situational and severity factors (instrument available at <http://ccf.fiu.edu>). Following DSM guidelines, diagnoses of ADHD, ODD, and CD were made if a sufficient number of symptoms were endorsed (considering information from parents and teachers). Two Ph.D. level clinicians independently reviewed ratings and interviews to confirm diagnoses and when disagreement occurred, a third clinician reviewed the file and the majority decision was used.

Procedure for PALS Interviews

Annual follow-up interviews were conducted by research staff. Informed consent was obtained, and participants were assured confidentiality except in cases of impending danger or harm to self or others. In cases where distance prevented travel to WPIC, information was collected through mailed and telephone correspondence; home visits were offered as needed. Self-report questionnaires were completed either with pencil and paper or computerized web-based versions. Confidentiality was supported with a Certificate of Confidentiality from the Department of Health and Human Services and the protocol was approved by the University of Pittsburgh Institutional Review Board.

Current Study

Data for the current study were taken from the childhood assessments conducted with the ADHD group and from the annual follow-up interviews conducted with the ADHD and comparison participants between 1999 and 2008. The current study utilizes longitudinal data from 539 males (ADHD group, $N=326$; Comparison group, $N=213$). Young adult female educational and occupational outcomes for the same sample are examined in another paper (Babinski et al. 2011).

Educational Outcomes Data were selected from the 19–22 year age range for the analyses examining educational outcomes (Median age for both groups=19.00). Out of the 539 males in the PALS database, 60 were not in the 19–22 year age range and 22 did not provide data due to refusal, death, or missing the scheduled visit, and eight were missing data on the relevant variables for a total of 449 males in this age range for the education analyses (ADHD group, $N=264$; Comparison group, $N=185$). For participants who had multiple data points for the 19–22 year age range, the first report was used unless otherwise indicated.

Occupational Outcomes Data were selected from the 23–32 year age range for the analyses examining occupational

outcomes (Median age for both groups=25.00). Out of the 539 total males in the PALS database, 133 were not in the 23–32 year age range, 85 did not provide data due to refusal, death, or missing their scheduled visit, and six were missing data for a total of 316 (ADHD group, $N=193$; Comparison group, $N=123$). For participants who provided multiple data points during this age range, the most recent report was used to maximize the number of years of data provided by each individual. All analyses of occupational outcomes included only employment since high school. Analyses of group differences and predictors of occupational achievement included only those who were not attending school ($N=217$) because the nature of employment during school may be different from typical full-time employment. Participants who attended school during ages 23–32 were significantly younger ($Mdn=25.00$) than those who were not in school at this time ($Mdn=26.00$), $p<0.05$.

Measures Collected at Follow-up

Demographic Information The demographic questionnaire was developed for this study and was completed yearly by both parents and young adults. Participants were asked about their age, living arrangements, income, and marital status.

Educational Information The Education History Questionnaire was developed for the PALS by adapting measures used in the Pittsburgh Adolescent Alcohol Research Center and Center for Education and Drug Abuse Research (Tarter 1997) studies. Both the parent and participant completed the questionnaire yearly. At the first follow-up interview, participants provided retrospective histories dating from kindergarten through their current grade at PALS entry. At each subsequent interview, participants provided updated information for the time since their last interview. For each grade, participants recorded the school attended, year attended, class placement (e.g. special education, learning disabled, approved private school, and educable mentally retarded), and result (e.g., promoted to next grade, repeated grade, dropped out). For grades K–12, respondents provided information about disciplinary actions such as number of times the participant was tardy. Post-high school education enrollment was coded as: no post-high school enrollment, vocational/technical school, junior/community college and “four-year” representing enrollment in public/private college or university. Community college, junior college, vocational school, and technical school were defined as two-year institutions with vocational/technical schools resulting in certification toward a specific occupational skill set (e.g. automotive technology) and community/junior colleges resulting in associate’s degrees. Four-year colleges/universities were defined as institutions offering bachelor’s degrees.

Academic Problems A summary variable was created to reflect academic problems from kindergarten to grade 12. Academic problems were placement in remedial classes, academic probation, grade retention, and failing one or more classes (classes failed were assessed only for grades 7–12). We decided to use a summary variable because when we ran collinearity diagnostics with the individual items, the highest variance inflation factor score was above 10, indicating a problem with multicollinearity (Myers 1990). Total occurrences for each academic problem were counted from kindergarten to grade 12. This sum was then divided by the number of data points available for each category to calculate a proportion score. For example, if a participant reported being on academic probation a total of six times, and data were available from kindergarten to grade 9, then the proportion score was calculated as $6/10=0.60$. The proportions for each academic problem were then summed to create an aggregate yearly index of academic problems. The ADHD ($M=0.45$, $SD=0.47$) and comparison groups ($M=0.04$, $SD=0.15$) differed significantly on this predictor variable, $F(1)=61.27$, $p<0.001$.

Disciplinary Problems A variable reflecting lifetime disciplinary actions was calculated in the same way as academic problems for the following actions: expulsions, suspensions (in and out of school), verbal and written warnings, and being sent to the principal’s office. The proportion score was recoded into categories because the continuous variable had a non-normal distribution with extreme outliers. A 0–1.0 yearly rate of disciplinary actions was coded as 0 (up to one disciplinary action, lifetime), a 0.11 to 1.00 yearly rate of disciplinary actions was coded as 1 (up to one disciplinary action a year), a 1.01–5.00 yearly rate was coded as 2 (more than one to five disciplinary actions a year), and a >5.00 yearly rate coded as 3 (more than five disciplinary actions a year). The distribution of this variable is as follows: category 0 (ADHD=8.7 % and Control=41.8 %); category 1 (ADHD=17.5 % and Control=33.3); category 2 (ADHD=27.8 % and Control=19.2 %); category 3 (ADHD=46 % and Control=5.6 %). The ADHD and comparison groups differed significantly on this variable, $\chi^2(15)=150.78$, $p<0.001$.

IQ and Achievement An estimate of the intelligence quotient (IQ) was calculated from the vocabulary and block design subtests of the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler 1981). Achievement was measured using the Wide Range Achievement Test Revision-3 (WRAT-3; Wilkinson 1993). Participants completed the WAIS either (a) at their first PALS interview for those age 17 or older, or (b) at the annual interview at which they had turned age 17. The IQ score for the ADHD ($M=103.08$, $SD=15.02$) and comparison groups ($M=114.10$,

$SD=14.42$) differed significantly, $F(1)=26.53$, $p<0.001$. The WRAT score for the ADHD ($M=94.61$, $SD=11.63$) and comparison groups ($M=106.14$, $SD=9.68$) also differed significantly, $F(1)=56.67$, $p<0.001$.

Vocational Information Work history was assessed using a measure that was adapted from the Work History section of the Young Adult Follow-Up Questionnaire (Jessor et al. 1991). This measure included a timeline of total jobs held, salary, reasons for leaving a job, number of months employed, job satisfaction, and problematic behavior in the workplace. At the first PALS interview, participants provided retrospective histories for any jobs held from the beginning of high school. At each subsequent interview, participants provided updated information for the time since their last interview. For this study, a job loss score was calculated by summing the total number of times the participant endorsed losing a job for a negative reason (fired, laid off, emotional problems, institutionalized/ incarcerated or drug problems) divided by the total number of jobs held since high school. An estimate of occupational status was obtained using the Hollingshead index (Hollingshead 1975). The Hollingshead index is an ordinal scale with nine employment codes ranging from: 1 (farm labors and service workers) to 9 (executives, professionals, etc.). An examination of the Hollingshead index (1–9) for employed participants showed that the distribution for the ADHD group was positively skewed, with the majority holding jobs in category 2 (unskilled worker) or 3 (machine operator, or semi-skilled) whereas the comparison group distribution was bimodal, peaking at category 2 (unskilled worker) and 6 (technicians and semi-professionals). For analysis, we grouped the nine codes into three categories of low, medium, and high status (codes 1–3, codes 4–6, and codes 7–9, respectively). Other studies have also condensed the individual codes into similar groupings (Cuffe et al. 1995).

Data Analytic Plan

Parental education was entered as a covariate in all analyses. Although there were no ADHD group differences in this variable as originally analyzed, group differences were observed after recoding parental education into a dichotomous variable for the current study, with 56.2 % of the ADHD parents (vs. 38.6 % of the control group parents) completing less than a bachelor's degree and 43.8 % of the ADHD parents (vs. 61.4 % of the control group parents) completing a bachelor's degree or higher, $\chi^2(1)=15.79$, $p<0.001$. Parental education in the current study was collapsed into two categories due to an insufficient number of parents in each individual educational category. Parental education was used as an indicator of SES. First, we examined group differences in education for the age range in

which individuals typically first enroll in post-high school education (ages 19–22) and group differences in employment status, occupational achievement, job loss, and other employment-related variables for the age range in which individuals typically are employed (after age 22; in this case, ages 23–32). After examining group differences, we analyzed predictors of post-high school education enrollment, occupational achievement, and job loss. We checked for multicollinearity of IQ, WRAT, and academic problems; the variance inflation factor scores were all less than 2.50, thus mitigating the concern for multicollinearity (Myers 1990). Logistic regression, multinomial logistic regression, analysis of covariance, multiple regression, and multivariate analysis of covariance were used as applicable. Covariates and predictor variables were entered simultaneously for all multivariate analyses.

Results

Group Differences in Post High School Education

Post-high school educational outcomes are shown in Table 1. Multinomial logistic regression was used to examine group differences in educational outcome. An overall group effect of ADHD was found. Follow-up analyses were conducted to identify where the differences occurred. These involved coding the educational variables such that four-year college was treated as the reference group in one regression and junior/community college was treated as the reference group in a second regression. The results in Table 1 show that, overall, the ADHD group was less likely to pursue education post-high school. Specifically, the ADHD group was less likely than the comparison group to be in four-year college relative to no school, to vocational/technical school, or to junior/community college. In addition, the ADHD group was less likely than the comparison group to be in junior/community college relative to not in school. The ADHD group did not differ from the control group in the odds of being in junior/community relative to being in vocational/technical school.

We also examined post-high school educational attainment in the 23–32 age range. We found that only 15 % of the young adults with ADHD held a four-year degree compared to 48 % of the control group and 0.06 % of the ADHD group held a graduate degree compared to 5.4 % of the control group, $\chi^2(11)=80.46$, $p<0.001$. From the ADHD group who were initially in community/junior college during the 19–22 age range, 56.1 % (vs. 25 % of controls) were still in community college, 17.1 % (vs. 58.3 % of controls) were in a four-year college, and 0 % (vs. 8.3 % of controls) were in graduate school by the time of the 23–32 year old follow-up (ADHD group, $N=160$ and Controls group, $N=110$).

Table 1 ADHD and comparison group differences in post high school education age 19–22

	ADHD N=264 %		Comparison N=185 %		<i>p</i>	
Post-high school education					<0.001	
No School	26.9		4.9			
Vocational	18.6		5.9			
Junior/Community	25.0		12.4			
Four-Year	29.5		76.8			
	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>		<i>OR (95 % CI)</i>
No School vs. 4 Year ^a	2.38	0.40	35.21	<0.001		10.87 (4.95–23.81)
Vocational School vs. 4 Year	1.80	0.38	22.00	<0.001		6.02 (2.84–12.82)
4 Year vs. Jr/Community	-1.42	0.30	22.75	<0.001		0.24 (0.14–0.043)
No School vs. Jr/Community	0.97	0.43	5.01	0.03		2.64 (1.13–6.19)
Voc/Tech vs. Jr/Community	0.38	0.42	0.83	0.36		1.47 (0.65–3.32)

Note: Model $\chi^2(9)=194.22, p<0.001$. Parent education and IQ were controlled in all analyses. Participants who did not enroll in any post-high school education between ages 19 and 22 were coded in the “no school” category. Four-year represents enrollment in public/private college or university.

^a These data reflect the odds of the ADHD group being in the first category.

Group Differences in Occupation

Employment and educational status was coded from participant’s most recent report (ages 23–32) using the following categories: unemployed and not in school, unemployed and in school, employed and not in school, and employed and in school. ADHD and comparison group differences in employment and education status were analyzed using multinomial logistic regression. Table 2 shows that between the ages of 23 and 32, the two groups differed significantly on their most recent report of employment and education status. More specifically, compared to the control group, the ADHD group was 11 times more likely to be unemployed and not in school relative to being employed or in school.

Multinomial logistic regression was used to examine three levels of occupational achievement for all participants who were not attending school during ages 23–32 (see Table 3); this obviated the need to control for age since the youngest participants were in school. Occupational achievement was determined by Hollingshead code for the most recent employment reported regardless of whether the participant was currently employed. Overall, the ADHD and comparison participants differed on occupational status. Follow-up analysis showed that compared to the control group, the ADHD group was four times more likely to be in unskilled versus clerical occupations and six times more likely to be in unskilled versus professional occupations. The ADHD group did not differ from the control group in the odds of having a clerical occupation relative to having a professional occupation.

Using logistic regression analysis, we examined types of employment termination. These analyses controlled for age to partial out the influence of the number of years in the

work force. All outcome variables were coded dichotomously, with zero as the reference group (e.g. never been fired=0, fired at least once=1). With respect to leaving a job, the ADHD group (61 %) was more likely to have ever been fired compared to the comparison group (43 %), *OR*=2.18, *b*=0.78, *SE*=0.24, *Wald*=10.42, *p*=0.001, $\chi^2(3)=14.53, p<0.01$. The ADHD group (33 %) was more likely to have ever been laid off compared to the comparison group (13 %), *b*=1.10, *SE*=0.31, *Wald*=12.49, *p*<0.001, *OR*=3.02, $\chi^2(3)=21.70, p<0.001$. Finally, the ADHD group (53 %) was also more likely to have ever quit a job due to dislike compared to the comparison group (36 %), *b*=0.59, *SE*=0.24, *Wald*=6.05, *p*=0.01, *OR*=1.81, $\chi^2(3)=16.53, p=0.001$. The two diagnostic groups also differed on the number of times fired, ADHD: *M*=0.76, *SD*=1.23, Comparison: *M*=0.17, *SD*=0.49, *F*(1, 316)=22.09, *p*<0.001, *partial* $\eta^2=0.07$; number of times laid off, ADHD: *M*=0.51 *SD*=0.91, Comparison: *M*=0.15, *SD*=0.42, *F*(1, 316)=13.71, *p*<0.001, *partial* $\eta^2=0.04$; and number of times quit, ADHD: *M*=0.99, *SD*=1.30, Comparison: *M*=0.54, *SD*=1.01, *F*(1, 316)=7.20, *p*=0.008, *partial* $\eta^2=0.02$.

Analyses of covariance showed that the two participant groups did not differ in the total number of jobs they had after high school, ADHD: *M*=7.43, *SD*=4.21 vs. Comparison: *M*=7.15, *SD*=2.93; *F*(1, 316)=0.06; *p*=0.80, but they did differ significantly in the total number of part time and full time jobs. The comparison subjects had more part time jobs since high school, *M*=4.10, *SD*=2.22 vs. *M*=3.17, *SD*=2.75, *F*(1, 316)=7.62, *p*=0.006, *partial* $\eta^2=0.03$ and the ADHD group had more full time jobs since high school, *M*=4.05, *SD*=3.17 vs. *M*=3.02, *SD*=2.26, *F*(1, 316)=6.14, *p*=0.01, *partial* $\eta^2=0.02$. The groups differed in the maximum hourly salary earned, ADHD: *M*=\$14.22, *SD*=

Table 2 ADHD and comparison group differences on educational and occupational status age 23–32

	ADHD N=193 %		Comparison N=123 %		<i>p</i>
Employment and Education Status					<0.001
Unemployed, not in school	16.6		2.4		
Unemployed, in school	8.3		8.9		
Employed, not in school	59.1		58.5		
Employed, in school	16.1		30.1		
	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR (95 % CI)</i>
Unemployed, not in school					
Employed, in school	-2.40	0.66	13.41	<0.001	0.09 (0.03–0.33)
Unemployed, in school	-1.93	0.72	7.12	<0.01	0.15 (0.04–0.60)
Employed, not in school	-1.83	0.63	8.59	<0.01	0.16 (0.05–0.55)

Note: Model $\chi^2(6)=30.80, p<0.001$. ADHD=attention deficit hyperactivity disorder. Parental Education was controlled in these analyses. Comparison group is the reference group.

\$12.42, Comparison: $M=\$16.50, SD=\$7.18, F(1, 308)=5.02, p=0.03, partial \eta^2=0.02$. The groups did not have any significant differences in mean salary earned, maximum number of months spent at a full or part-time job, leaving a job due to poor salary, and leaving a job because they did not have enough time for a job.

Predictors of Post-high School Educational Outcomes

Multinomial logistic regression was used to test whether an ADHD diagnosis, academic and behavior problems in school, and WRAT scores, in addition to parent education and IQ predicted post-high school enrollment.

The results are shown in Table 4. Academic problems, WRAT scores, parental education, and disciplinary problems predicted type of post high school education enrollment. Those who had fewer lifetime academic problems, who had higher WRAT scores, and who fell in the lowest

disciplinary category were more likely to enroll in a four-year college/university compared to those who did not enroll in post-high school education, to those who enrolled in a junior/community college or vocational/technical school. None of the predictors significantly differentiated those who enrolled in vocational/technical school and those who enrolled in junior/community college from those who did not enroll in post-high school education.

Next, we tested whether academic problems and disciplinary problems were mediators for the relationship between ADHD and post-high school education using the joint significance approach outlined by MacKinnon and colleagues (2002; 2007). The first step of this approach was tested with parental education, ADHD diagnosis, and IQ predicting academic problems using multiple regression and multinomial logistic regression for disciplinary problems. ADHD was a significant predictor of academic problems, $F(3, 446)=64.99, p<0.001$, and disciplinary problems for every

Table 3 ADHD and comparison group differences on occupational achievement age 23–32

	ADHD N=142 %		Comparison N=75 %		<i>p</i>
Hollingshead Level					<0.001
Group 1 (Unskilled)	72.5		36		
Group 2 (Clerical)	21.8		44		
Group 3 (Professional)	5.6		20		
	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR (95 % CI)</i>
Group 2 vs 1 ^b	-1.35	0.34	15.97	<0.001	0.23 (0.13–0.51)
Group 3 vs 1	-1.84	0.50	13.64	<0.001	0.16 (0.06–0.42)
Group 2 vs 3	0.49	0.52	0.91	0.34	1.63 (0.60–4.50)

Note: Model $\chi^2(4)=30.16, p<0.001$. ADHD=attention deficit hyperactivity disorder. Examples of Group 1 jobs include bus drivers, waiters, and janitors. Examples of Group 2 jobs include law enforcement, secretaries, and cashiers. Examples of Group 3 jobs include social workers, registered nurses, and lawyers. Only people who were not currently attending school at the same time were included in these analyses. Parental Education was controlled in these analyses.

^b These data represent the odds of the ADHD group being in the first category listed.

Table 4 Multinomial logistic regression predicting post high school type of education

Predictors	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR (95 % CI)</i>
4 Year College vs. No School^a					
Academic Problems	-1.93	0.57	11.61	<0.01	0.15(0.05–0.44)
WRAT	0.07	0.02	10.27	<0.01	1.07 (1.03–1.12)
Higher Parental Education ^c	1.17	0.36	10.36	<0.01	3.22 (1.58–6.58)
Disciplinary Category^e					
Up to 1x/year	-0.66	0.69	0.90	<0.34	0.52 (0.13–2.02)
More than1 to 5 x a year	-1.94	0.66	8.63	<0.01	0.14 (0.04–0.52)
>5x year	-2.29	0.66	11.87	<0.01	0.10 (0.03–0.37)
IQ	0.03	0.02	2.62	0.11	1.03(1–1.06)
ADHD (no=0, yes=1) ^d	-0.76	0.48	2.55	0.11	0.47 (0.18–1.19)
4 Year College vs Vocational/Tech^b					
Academic Problems	-1.68	0.59	8.04	<0.01	0.20 (0.06–0.60)
WRAT	0.07	0.02	8.48	<0.01	1.07 (1.02–1.12)
Higher Parental Education ^c	1.09	0.38	8.26	<0.01	2.96 (1.41–6.21)
Disciplinary Category^e					
Up to 1x/year	-0.12	0.60	0.04	0.84	0.88 (0.27–2.88)
More than1 to 5 x a year	-1.26	0.57	4.79	0.03	0.29 (0.09–0.88)
>5x year	-1.28	0.59	4.63	0.03	0.28 (0.09–0.89)
IQ	0.03	0.02	4.32	0.04	1.04 (1–1.07)
ADHD (no=0, yes=1) ^d	-0.50	0.46	1.15	0.28	0.61 (0.25–1.52)
4 Year College vs Jr/Community^b					
Academic Problems	-1.57	0.55	8.01	<0.01	0.21 (0.07–0.62)
WRAT	0.05	0.02	7.35	<0.01	1.06 (1.02–1.10)
Higher Parental Education ^c	0.73	0.31	5.45	0.02	2.07 (1.12–3.83)
Disciplinary Category^e					
Up to 1x/year	-0.85	0.50	2.95	0.09	0.43 (0.16–1.13)
More than1 to 5 x a year	-1.53	0.51	9.11	<0.01	0.22 (0.08–0.56)
>5x year	-1.62	0.54	9.14	<0.01	0.20 (0.07–0.57)
IQ	0.02	0.01	4.18	0.12	1.02 (1–1.05)
ADHD (no=0, yes=1) ^d	-0.26	0.38	0.98	0.50	0.78 (0.37–1.61)

Note: Model $\chi^2(24)=239.66, p < 0.001$. *B*=logistic coefficient; WRAT=Wide Range Achievement test at age 17 or age at the first follow-up interview. ADHD group: *N*=226 and Comparison group: *N*=185. Variables were entered simultaneously. ^areference group is No School. ^breference group is Vocational/Tech. ^creference group is lower parental education. ^dreference group is the Comparison group. ^ereference group is up to one disciplinary action, lifetime. ^freference group is Jr/Community.

level of the variable, $\chi^2(9)=139.50, p < 0.001$. This information combined with the results in Table 4 indicates that academic and disciplinary problems are significant mediators of the relationship between ADHD diagnosis and post-high school education.

Predictors of Occupational Outcomes

Using ordinal regression, occupational level (low, medium, high) from the most recent interview was regressed on the same set of predictors used in the education analyses with the addition of one predictor: post-high school educational enrollment. Participants attending school between the ages of 23–32 were excluded from the analysis. Results are shown in Table 5.

Disciplinary actions, post-high school educational enrollment, and ADHD diagnosis were the only statistically significant predictors of occupational level. Participants in the

ADHD group were three times more likely to be in the lowest occupational level. Participants who did not attend post-high school education or who enrolled in a junior/community college were 4-2 times more likely to be in the lowest occupational level compared to those who enrolled in a four-year school. Additionally, a follow-up analysis changing the reference group for the disciplinary actions variable (reference group=more than five disciplinary actions a year) showed that participants who had one to five disciplinary actions a year were almost three times more likely to be in a higher occupational level compared to people who had more than five disciplinary actions a year *OR*=2.94, *b*=1.08, *SE*=0.52, *Wald*=4.33, *p*=0.04.

Next, we tested whether post-high school education would be a mediator for the relationship between ADHD diagnosis and occupational attainment. For the first step of this model we regressed post-high school education on ADHD diagnosis, parental education, academic problems,

Table 5 Ordinal regression predicting occupational outcomes

Predictors	<i>B</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR (95 % CI)</i>
Academic Problems	0.38	0.50	0.56	0.45	1.45 (0.54–3.89)
WRAT	−0.02	0.02	0.51	0.48	0.98 (0.94–1.03)
Higher Parental Education ^a	0.33	0.39	0.73	0.39	0.72 (0.34–1.54)
Disciplinary Category ^b					
Up to 1x/year	0.91	0.45	4.12	0.04	2.49 (1.03–6.03)
More than 1 to 5 x a year	0.37	0.52	0.50	0.48	1.44 (0.52–4.01)
>5x year	−0.17	0.56	0.09	0.76	0.84 (0.28–2.52)
IQ	0.02	0.02	2.20	0.14	1.02(0.99–1.06)
ADHD (no=0, yes=1) ^c	−1.10	0.46	5.65	0.02	0.33 (0.84–5.56)
Post High School Education ^d					
No School	−1.51	0.69	4.79	0.03	0.22 (0.06–0.85)
Vocational/Technical School	−0.85	0.64	1.77	0.18	0.43 (0.12–1.49)
Junior/Community	−1.62	0.64	6.47	0.01	0.20 (1.21–7.49)

Not: Model $\chi^2(11)=47.98, p<0.001$. Occupational outcomes=Hollingshead category. WRAT=Wide Range Achievement test at age 17 or age at the first follow-up interview. ADHD group: $N=99$ and Comparison group: $N=67$.

^a reference group is lower parental education.

^c reference group is the Comparison group.

^b reference group is up to one disciplinary action, lifetime

^d reference group is four year school.

disciplinary problems, and WRAT scores. With all the covariates in the model, ADHD was not a significant predictor of post-high school education, thus, we were not able to pursue the mediation model.

An analysis of covariance was conducted with diagnostic status, IQ, WRAT scores, academic problems, disciplinary problems, and post-high school education as predictors of job loss. Diagnostic group status, $F(1, 232)=4.54, p=0.03$, partial $\eta^2=0.02$ and lifetime academic problems were the only significant predictors, $F(1, 232)=7.74, p=0.006$, partial $\eta^2=0.03$.

Discussion

The first aim of the current study was to examine group differences in post-high school educational and occupational attainment between young adults who were and were not diagnosed with ADHD as children. As expected, significant group differences were found for nearly all variables, with the ADHD group, on average, achieving lower levels of educational and occupational outcomes relative to the comparison group. The second aim of the study was to examine predictors of post-high school educational and occupational achievement and outcomes. Diagnostic group status (ADHD versus no ADHD in childhood), achievement test scores at age 17, disciplinary problems, and academic problems were significant predictors of educational and occupational outcomes. In addition to providing an updated

replication to ADHD-related underattainment, our findings clarified discrepant results on educational and occupational outcomes from the previous literature and reported on predictors of the type of post-high school education enrollment and level of occupational attainment.

Group Differences in Post-High School Education

As hypothesized, participants with ADHD histories relative to those without were far less likely to enroll in a four-year college (versus vocational and junior/community colleges) upon the completion of high school—they were 11 times more likely to not enroll in any school versus enrolling in a four-year college. About half of the individuals with ADHD histories attended vocational or junior colleges compared to only 18 % of the comparison group. These results are consistent with previous studies (Barkley et al. 2008; Mannuzza et al. 1997). Another study using the PALS sample compared young adult women with and without ADHD on post-high school education and found that young adult women with ADHD did not differ significantly from the women without ADHD; however, the pattern of findings for women is similar to the current study's findings comparing young adult men with and without ADHD (Babinski et al. 2011). A slightly higher percentage of our participants with ADHD histories enrolled in a four-year college, 29 % vs. 21 % (Barkley et al. 2006) or any form of post-high school education, 73 % vs. 55 % (Paternite et al. 1999) compared to previous studies. The current study gathered data at annual

follow-ups and evaluated whether a person attended college at any time between the ages of 19–22, whereas the Milwaukee and Iowa studies gathered young adult follow-up information at only one time point (Barkley et al. 2006; Paternite et al. 1999). Because young adult follow-up data collection for the Iowa study occurred from 1978–1983 and from 1992–1996 for Milwaukee study, it is possible that college attendance in our sample was higher as a result of cohort effects (US Department of Education 2009). In fact, the United States government has been making efforts to increase the amount of evidence-based services available to students with disabilities who are transitioning out of high school, and this may have increased college enrollment (e.g. National Secondary Transition Technical Assistance Center; Test et al. 2009).

Group Differences in Occupation

Employment and education status was examined for young adults ages 23–32. The ADHD and comparison groups differed on two major categorical outcomes; there were significantly more participants from the ADHD group unemployed and not in school (16.6 % versus 2.4 %) and significantly more comparison participants employed and in school (30.1 % versus 16.1 %). Relative to the comparison group, the ADHD group was more likely to not be engaged in employment or school post-high school.

Similar to the results of the post-high school educational outcomes, participants with childhood ADHD were less likely to be in higher status vocations relative to the comparison group. In the 23–32 age range, the majority of the ADHD group held jobs reflecting the skilled manual workers category (e.g. carpenter and firefighter) on the Hollingshead scale while only 6 % held jobs in the professional category versus 20 % of the comparison group. These results are consistent with the New York study of occupational outcomes (Mannuzza et al. 1997). Corresponding to the results of the Milwaukee study, the PALS ADHD group held more full-time jobs in relation to the comparison group since graduating high school. Barkley and colleagues (2006) surmised that their results were due to individuals with ADHD seeking employment rather than additional education after graduating high school. We were able to test this hypothesis post-hoc and found that there were more participants from the ADHD group working and not in school soon after high school compared to comparison group. This suggests that lower job status at the point of entry into the labor force is expected for individuals with ADHD histories (Borland and Heckman 1976). Indeed, there was close to a two-dollar per hour difference in wage for the maximum wage reported, with the ADHD group earning less than the comparison group. This wage difference has the potential to translate into thousands of dollars over a lifetime

(Biederman and Faraone 2006). Further evidence of this differential employment trajectory in adulthood is apparent in that many more in the ADHD group had been fired from a job, laid off, or quit compared to the comparison participants, which is also consistent with the results of the Milwaukee study (Barkley et al. 2006). It appears that young adults with ADHD may contribute to their own job instability by quitting more frequently than the control group. Future research would benefit from examining the circumstances surrounding employment termination and whether specific opportunities exist for intervention (e.g. career assessments that include collateral reporters to identify skill strengths and matching employment opportunities).

These results differ from the study by Weiss and colleagues (1979), which did not find any differences on occupational measures between participants with and without an ADHD diagnosis who were working full-time. Limiting analyses of occupational outcomes to include only those with full-time employment may exclude people too impaired to participate in full-time employment. The results of this study, which included people with part-time and full-time jobs, are more representative of the general population of adults with childhood ADHD. Furthermore, the age range of participants for the Montreal study's 10–12 year follow-up was 17–24 years old with a mean age of approximately 19; thus, at least 50 % of young adults who were working full-time would not have completed college. This may have led to restricted variability in the jobs that were represented in the Montreal study. Higher status jobs often require a bachelor's degree and even a graduate degree, which many people in the 17–24 age range may not have attained at the time of the follow up. The restricted age range may be the reason why the PALS sample, unlike the Montreal study, had representation in all of the Hollingshead occupational categories.

Predicting Post High School Educational and Occupational Outcomes

This study is the first to examine predictors of the type of post-high school education and occupational attainment with young adults who either were or were not diagnosed with ADHD in childhood. Although the majority of the participants with childhood ADHD attained less education compared to the participants without ADHD, a range of academic functioning in young adulthood was observed. For example, 30 % of the ADHD group pursued higher education at a traditional four-year degree granting institution. Although, on average, young adults with ADHD had worse outcomes on educational and occupational variables, there was evidence for individual differences in functioning.

Academic problems (e.g. remedial course placement, grade retention, class failure, and academic probation),

disciplinary problems (e.g. suspensions, verbal or written warnings, being sent to the principal's office, and expulsions), and achievement test scores at age 17 significantly predicted post-high school education (ages 19–22). In addition, academic and disciplinary problems were found to be significant mediators of post-high school education. Interestingly, these predictors along with parental education accounted for all of the group differences explained by childhood ADHD diagnosis, as diagnosis was not a significant predictor when the other variables were taken into account. These findings support our hypothesis that indices of behavioral and academic functioning in schools—not necessarily the diagnosis itself—account for the difference in educational achievement between the ADHD and comparison groups. The findings from the current study parallel the findings with younger age groups that show that ADHD has an indirect relationship with academic outcomes in elementary school and high school (Rapport et al. 1999; Langberg et al. 2011). These results highlight the importance of intervening with youth to improve school related behavior and academic performance with the hope of impacting long-term success in educational achievement.

Unlike the results of our post-high school education analyses, the difference between the ADHD and comparison groups was not fully accounted for by the other predictor variables for occupation status. Participants with childhood ADHD, disciplinary problems in school, and those who either did not enroll in post-high school education or enrolled in a junior/community college were less likely to be in a higher occupational level. Although post-high school education was a significant predictor, it did not explain the relationship between ADHD and occupational attainment as evidenced by our mediation analysis. Regardless of diagnostic category, those who attended a four-year college were about five times more likely to have a higher occupational status than those who did not attend school or those who attended junior/community college. Given that post-high school education was the strongest predictor for occupational outcomes, support for choosing the appropriate course of higher education may benefit young adults with ADHD. Children with similar academic difficulties are about equally as likely to be either in vocational/technical school, junior/community college, or not enrolled in post-high school education. However, these three types of schooling lead to differences in occupational outcome. Vocational/technical schools focus on teaching a particular trade and can be completed in two years; thus, the quick time to graduation and focused curriculum may seem more promising for young adults with ADHD who have not been successful in traditional academic settings (Arum and Shavit 1995). However, enrolling in junior/community college did not lead to different occupational outcomes compared to those who did not attend post-high school education. Thus, there does not seem to be incremental value in attending a

junior/community college for individuals with ADHD in terms of occupational achievement. Future studies should examine the benefits for individuals with ADHD of attending various types of post-high school education for occupational achievement, particularly since these programs differ in their length, cost, and in some cases, outcome.

Although 30 % of participants with childhood ADHD enrolled in a four-year college only 5.6 % (versus 20 % in the comparison group) held professional jobs (e.g. executive positions, engineer, doctor) during ages 23–32. Relatedly, Biederman and colleagues (2008) found that individuals with ADHD attained lower occupational status compared to peers despite having the same educational background. This discrepancy might be related to the possibility that adolescents with ADHD histories perform poorly or drop out of college and are less likely to pursue graduate/professional degrees (DuPaul et al. 2009; Barkley et al. 2008). In fact, we found that only 15 % of young adults with ADHD in the 23–32 age range held a four-year degree compared to 48 % of the control group. We also found that a higher percentage of participants in the ADHD group who were in junior/community college in the 19–22 age range were still in community college and none were in graduate school by the time they reached the 23–32 year age range. On the other hand, the progression of educational achievement for the control group was much more apparent.

In addition, academic problems and a childhood diagnosis of ADHD were statistically significant predictors of job loss, independent of IQ, parental education, high school achievement, disciplinary problems, and post-high school education. This implies that other variables related to an ADHD diagnosis that were not captured in this study—for example interpersonal skills—might be related to occupational outcome. In fact, Hechtman and colleagues (1984) showed that a measure of adult and peer relationships from childhood predicts occupational outcomes. This implies that other variables, besides the academic-related variables, are important for maintaining employment. It also appears that a different set of variables predicts occupational attainment versus employment stability with type of post-high school education influencing attainment, but not stability. Although vocational/guidance counseling is available in most high schools, young adults with ADHD may benefit from services that go beyond obtaining employment to teaching skills about how to maintain employment successfully.

Strengths and Limitations

The PALS participants are composed of children who were referred to a clinic for ADHD and therefore may not be representative of all children with ADHD. On the other hand, the sample was representative of Allegheny County, PA, the place where the study occurred. One potential

limitation of our analyses is the absence of a categorical measure of learning disability. However, our inclusion of achievement scores adequately accounts for learning disability classification based on research that demonstrates that estimating learning disability based on low achievement is acceptable for research (Fletcher et al. 2005). Another limitation is that the current study did not include medication use as a predictor. Medication use was not included in the analyses because other studies have shown that childhood treatment did not predict adolescent or young adult achievement (e.g. Langberg et al. 2011; Molina et al. 2009; Pelham et al. 2005) or occupational outcomes (e.g. Paternite et al. 1999). Furthermore, the authors feel that examining treatment as it relates to later outcomes calls for a refined and complex approach to measurement and analysis, such as examining trajectories of utilization across time (Kuriyan, et. al., in preparation).

Few studies have longitudinal data on children diagnosed with ADHD past the age of 25 and one strength of this study is the yearly data collection up until the age of 32. In addition, PALS collected annual parent data, which was used to confirm self-report of academic and vocational information. Although limitations exist, the current study improves on its predecessors by detailed analysis of jobs held in young adulthood and including predictors from middle school, high school, and young adulthood. Furthermore, this is the first study to report on the predictors of post-high school education enrollment and predictors of occupational attainment for individuals diagnosed with ADHD in childhood.

Conclusions and Future Directions

The transition into young adulthood is a unique period marked by increases in available choices (due to the end of formal schooling) and decreases in structure and support (Schulenberg et al. 2004). The results from this study in combination with more qualitative work about this transition (e.g. Mortimer et al. 2002) could provide useful information for professionals who help kids with ADHD transition to life after high school graduation.

This study documents the ongoing impairment in daily life functioning experienced by young adults diagnosed with ADHD in childhood. Our study shows that in the transition period after high school, young adults with ADHD are more likely to obtain employment or enroll in a two-year degree program. However, individual variability in functioning was evident, with one-third of the youth with ADHD choosing to attend a four-year college. Although still evident, the variability in functioning decreased for occupational outcomes with majority of the ADHD sample in lower status jobs.

Although children diagnosed with ADHD are at greater risk for post-high school educational and occupational

under-attainment, potential mediators of success may be in academic and disciplinary domains through the course of their life.

Without accommodations and support continuing into the young adult years, even the youth who were successful enough to enroll in a four-year college may not be able to compete with others without ADHD (as evidenced by a low college completion rate and low occupational status). Our study showed that after enrolling in junior/community college, fewer young adults with ADHD moved on to a higher educational status by the time they were in their mid-twenties. Thus, supported by this study is the need for continuing treatment in young adulthood that focuses on important milestones, such as graduating from post-high school education and gaining employment. Many individuals with ADHD qualify for assistance throughout secondary and post-secondary school through the Individuals with Disabilities Education Act and the Americans with Disabilities Act. As parental education significantly contributed to post-high school educational outcomes, future studies should explore the impact of parental ADHD and education on child educational outcomes. Future research should also examine whether young adults with ADHD take advantage of the resources available to them when they attend post-high school education. In addition, examining the effect of lifetime treatment history (type and timing of treatment) on the relationship between diagnostic status and educational and occupational achievement would be informative for planning interventions for children diagnosed with ADHD.

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Conflict of Interest The authors declare that they have no conflict of interest.

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