ADHD Attention Deficit and Hyperactivity Disorders (2019) 11:279–287
https://doi.org/10.1007/s12402-019-00292-w

ORIGINAL ARTICLE

Attention deficit/hyperactivity disorder and future expectations in Russian adolescents

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Received: 26 March 2018 / Accepted: 26 February 2019 / Published online: 9 March 2019

Abstract

In recent years, there has been an increasing focus on the role of future expectations—the extent to which a future outcome is deemed likely—in the health and well-being of adolescents, with research linking future expectations to outcomes such as an increased likelihood of engaging in risky health behaviors. As yet, however, there has been no research on future expectations and attention deficit/hyperactivity disorder (ADHD) in adolescence. To address this research gap, the current study examined the association between ADHD symptoms/possible ADHD status and future expectations in a school-based sample of adolescents. Data were analyzed from 537 Russian adolescents (aged 12–17) with teacher-reported ADHD symptoms and self-reported future expectations. Logistic regression analysis was used to examine associations. In fully adjusted analyses, inattention symptoms/possible ADHD inattentive status was associated with lower future educational expectations, while a possible ADHD hyperactivity status was associated with increased odds for negative future expectations relating to work, family and succeeding in what is most important. The findings of this study suggest that greater ADHD symptoms/possible ADHD status in adolescence may be linked to an increased risk for negative future expectations across a variety of different life domains.

Keywords ADHD · Adolescent · Future expectations · Hyperactivity · Inattention

Introduction

Adolescence is a developmental period marked by rapidly occurring physical, psychological, and social changes (Christie and Viner 2005). Besides more immediate tasks such as the development of one's self-concept/identity (Steinberg and Morris 2001) and establishing independence and autonomy (Christie and Viner 2005), it is also a period when young people begin to look to the future. In particular, in the wake of cognitive and perceptual development, it has been suggested that children start thinking about more distant events such as future education,

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occupation, and family life at age 11–12 years (Nurmi 2005). Although this future orientation has been conceptualized as consisting of different processes (Nurmi 1991), in recent years, an increasing focus has been placed on one of its elements—future expectations (Prince et al. 2016)—which have been defined as "the extent to which one expects an event to actually occur" (Sipsma et al. 2015), with studies showing that expectations of future academic, occupational, and familial success are associated with a variety of beneficial outcomes in adolescence including fewer problem behaviors (Dubow et al. 2001), increased socioemotional adjustment (Wyman et al. 1993), as well as positive youth development (Schmid et al. 2011).

Despite this research, much remains to be elucidated about the occurrence and effects of future expectations in adolescence across different groups/populations. For example, although some studies have suggested that most adolescents envisage the future positively (Iovu 2015), other research has highlighted how specific groups such as those who experience socioeconomic disadvantage (Raffaelli and Koller 2005), or acute stressors in childhood (Thompson et al. 2012) have more negative expectations about future events. Similarly, worse mental health (depressive symptoms) has also been linked to negative future expectations in adolescence (Iovu et al. 2018). The finding that some adolescents are more likely to have negative future expectations is important given that negative expectations have themselves been linked to potentially harmful outcomes such as an increased likelihood of engaging in risky health behaviors (Griffin et al. 2004; Sipsma et al. 2015; Valadez-Meltzer et al. 2005). Moreover, negative future expectations in adolescence may have detrimental effects that extend across time. Studies have shown, for instance, that adolescent expectations of an early death are associated with lower educational attainment and income in young adulthood (Nguyen et al. 2012a) as well as an increased risk of engaging in suicidal behavior (Nguyen et al. 2012b).

Children and adolescents with developmental disorders comprise one group where there has been little research on future expectations. To address this gap, the current study will examine attention deficit/hyperactivity disorder (ADHD) and future expectations in adolescents. Determining the association between ADHD and future expectations might be especially important given that adolescent ADHD has been linked to a range of detrimental outcomes such as worse academic performance (Frazier et al. 2007), family dysfunction (Kaplan et al. 1998), and comorbid mental disorders (Jensen and Steinhausen 2015) which might affect future expectations (Dubow et al. 2001; Iovu et al. 2018). It is possible, however, that other factors might also be important in this context. For example, as research has indicated that some adolescents with ADHD may overestimate their own competence/skills across different domains (behavioral, scholastic, social) (Bourchtein et al. 2017), it is possible that this 'positive illusory bias' might also be reflected in their future expectations of success.

To the best of our knowledge, as yet, there has been no quantitative research on the specific association between ADHD and future expectations. An earlier longitudinal study which examined the link between ADHD symptoms and future orientation in 192 Swedish children, where expectations of education and employment success were included in an aggregated orientation measure, found that higher ADHD symptoms in grade 11 predicted a poorer future orientation in adolescents in grade 12 (Scholtens et al. 2013). In addition, a qualitative study of 10 adolescents with ADHD aged 13–18 living in Sweden/Norway also highlighted their worries about future events relating to such outcomes as their employment prospects and whether they would be able to find a partner to settle down with and have a normal family life (Hallberg et al. 2010).

Given the absence of research on this topic, and that some studies have shown that ADHD symptoms when measured continuously may be associated with negative outcomes in adolescents (Isaksson et al. 2018), while other research has highlighted the especially detrimental effects of clinically significant ADHD symptom levels (Sasser et al. 2016), the current study had three aims: (1) to determine whether possible ADHD status/ADHD symptoms are associated with future expectations; (2) to examine whether there are differences in the association between different ADHD subtypes (inattentive/hyperactive) and future expectations; and (3) to establish whether the association between ADHD and future expectations varies across different expectation outcomes.

Methods

Participants and procedure

This study uses data from the Social and Health Assessment (SAHA) study which was conducted in Arkhangelsk, a medium-sized city (356,000 people) in the northwest part of European Russia. Details of the study procedure have been published previously (Ruchkin et al. 2008). In brief, a two-stage sampling procedure was used. The aim was to select a sample of students that was representative of all students in the city who were in the 12–17 age range. In stage 1, random sampling was used to select 14/71 schools from the city's 4 districts that contained 210 classes in the 6–11 grade range. In stage 2, data were

collected from students in 20 randomly selected classes. This was done by having students self-complete a standard questionnaire (where their responses were confidential) during a normal classroom teaching period. Information was obtained about the student's family, home and school life, activities outside school and in the community, health behaviors, and on physical (somatic) and mental health. Two instructors were present during the data collection phase. One read the questionnaire out loud to the students while they followed along. The second instructor was available to answer any questions students might have during the questionnaire completion process. In addition, teachers were given a small booklet to complete about the children in their own classes that contained questions on ADHD symptoms. They did this at home and responses were collected after a couple of days. A small payment was made to the teachers for undertaking this work. This data collection process resulted in 537 adolescents [mean age 14.37 (SD = 0.96)] who had teacher-reported data on ADHD symptoms being included in the current study. Prior to their inclusion in the study informed consent was obtained from all participants. The study was approved by the institutional review committee at the Northern State Medical University, Arkhangelsk, Russia, and Yale University, School of Medicine, Connecticut, USA.

Measures

Future expectations (dependent variable)

Future expectations were measured with seven items. Students were asked, what are the chances that (a) You will graduate from high school? (b) You will go to college? (c) You will have a job that pays well? (d) You will have a happy family life? (e) You will stay in good health most of the time? (f) You will find a job you will enjoy? (g) You will succeed in doing what is most important for you? Response options ranged from very low (scored 1) to very high (scored 5). Questions (a)–(e) were taken from the Health Behavior Questionnaire that was used in the Rocky Mountain Middle/High School Study (Jessor et al. 1992). Questions (f) and (g) were developed by the SAHA research team and added to items (a)–(e) to create a seven-item Expectations about the Future Scale (Ruchkin et al. 2004). The scale had a good level of internal consistency with the present sample (Cronbach's alpha = 0.83). Following the lead of an earlier study (Griffin et al. 2004) the analytical focus of this paper was on negative future expectations. To do this, a dichotomized measure was created where believing that one's chances of obtaining a particular outcome were either low or very low was coded 1 whereas believing they were either 50–50, high or very high was coded 0.

ADHD symptoms (independent variable)

ADHD comprises two main aspects—inattention and/or hyperactivity–impulsivity (American Psychiatric Association 2013). In the current study, we used teacher reports of inattention and hyperactivity–impulsivity symptoms in the previous 6 months obtained with a shortened version of the ADHD Rating Scale-IV (DuPaul et al. 1998) which uses the 12 best teacher-rated predictor items for a clinical diagnosis of ADHD (Power et al. 2001). Items are rated on a four-point scale from never (scored 0) to almost always (scored 3). Each scale had a good level of internal consistency (Cronbach's alpha for the 6 inattention items was 0.89, and for the six hyperactivity–impulsivity items, it was 0.94). ADHD scores were categorized in two ways in this study. First, scores for the 12 individual items were added to create an overall ADHD continuous symptom score variable [ADHD-Total (inattention and hyperactivity–impulsivity symptoms combined)] that could range from 0 to 36. Summed continuous scores (ranging from 0 to 18) were also created for the inattention (ADHD-Inattentive) and hyperactivity–impulsivity (ADHD-Hyperactive) symptoms separately (Isaksson et al. 2018). Second, categorical variables were also created where those adolescents who had ratings of either often (2) or almost always (3) for all six inattention items but not for all six hyperactive items were categorized as having a possible ADHD-Inattentive status, while children scoring (2) or (3) for all six hyperactivity–impulsivity items but not for all six inattention items were classified as having a possible ADHD-Hyperactive status. An Any-ADHD category was also created that included children who were in the ADHD-Inattentive or ADHD-Hyperactive categories and those children who had full scores (6) for both inattention and hyperactivity and were thus in both categories.

Control variables

Demographic information was included in the analysis on the children's age and sex. Parental education was used as a marker of the family's socioeconomic status (SES) and was dichotomized as families where at least one of the parents/guardians had a college education or those families where no one had a college education, although there were a large number of cases with missing answers (22%). Family structure was used as an indicator of possible family disruption. This variable was divided into four categories—families where both biological parents were present, single-parent households, extended families where both biological parents were living with other biological relatives (grandparents,

aunts, uncles) and families which were based on 'other' living arrangements (e.g., step-parents, other adults, etc.). Children's depressive symptoms were assessed with an adapted version of the Center for Epidemiologic Studies—Depression Scale (CES-D) (Radloff 1977). This comprises 10 negative statements such as 'I felt lonely', 'I felt like crying' and 'I felt really down' that enquire about depressive symptoms in the past 30 days. The response options were not true (scored 0), somewhat true (scored 1), and certainly true (scored 2). In this study, answers from the individual items were summed to create a continuous score that could range from 0 to 20 with higher scores indicating increased depressive symptoms. The internal consistency of the scale was good (Cronbach's alpha = 0.83).

Statistical analysis

Descriptive statistics and Chi-square (for categorical) and Mann–Whitney *U* tests [for continuous variables (due to skewness)] were conducted to compare differences in the sample characteristics between adolescents with a possible ADHD status (Any-ADHD) or non-ADHD status. Logistic regression analysis was used to examine the association between ADHD and negative future expectations for each of the seven future expectations. Two separate analyses were performed. In the first analysis, associations were examined between ADHD symptoms and negative future expectations using ADHD symptom scores as a continuous variable. In the second analysis, associations were examined between having a possible ADHD status (i.e., a categorical variable) and negative future expectations. For the ADHD symptom scores, three analyses were performed where associations were examined between ADHD-Inattentive and ADHD-Hyperactive symptoms scores (range 0–18 for both) and the ADHD-Total symptoms score (range 0–36) and negative future expectations. For the possible ADHD status categorical variable, we had initially planned to run three separate analyses where we used DSM categories to examine the association between a possible (1) inattentive status, (2) hyperactive status, and (3) combined symptom status (with adolescents who had both hyperactive and inattentive symptoms), and negative future expectations. However, due to the low number of children with combined symptoms this was not possible. Instead, we ran three analyses where in the first analysis we included only children with inattentive symptoms (i.e., those with a possible ADHD-Inattentive status), in the second analysis we included children with only hyperactive symptoms (possible ADHD-Hyperactive status), while in a third analysis, we included all children with a possible ADHD status, i.e., those with a possible inattentive status only, those with a possible hyperactive status only and those with a possible combined (inattentive–hyperactive) symptom status (with this variable being termed 'Any-ADHD').

As initial analyses showed there were no differences between possible ADHD (Any-ADHD) and non-ADHD status children for age and the SES variables [family structure and parental education (see below)] in the logistic regression analyses two models were run. In Model 1 we adjusted for school site. In Model 2, we additionally adjusted for sex and depressive symptoms, as the latter has been linked to both ADHD and negative future expectations (Hurtig et al. 2007; Iovu et al. 2018). The results are presented as odds ratios (OR) and 95% confidence intervals (CI). The level of statistical significance was set at $p < 0.05$. All analyses were performed with IBM SPSS Statistics version 22.

Results

Sample characteristics

Of the 537 children, 34 (6.3%) were rated by teachers as having a possible ADHD status (Any-ADHD), with 18 (3.4%) being in the possible ADHD-Hyperactive only status category, 10 (1.9%) being in the ADHD-Inattentive only status category and 6 being in the combined category (Hyperactive–Inattentive) (1.1%). There was no difference between Any-ADHD and non-ADHD status in terms of age [mean (SD) 14.21 (0.97) vs. 14.38 (0.96), $U = 7751.50$, $p = 0.336$] although there was a significantly higher prevalence of boys in the Any-ADHD group (69.7% vs. 46.8%, $p = 0.011$). For those children who provided information about their parents' level of education, most children (56%) had at least one of their parents go to college, while there was no difference between the Any-ADHD/non-ADHD groups in terms of parental education level ($p = 0.073$). Just over 40% of children lived with both biological parents, 35.4% were in the 'other' family category, while 17.4% lived in single-parent families (where only one adult was present). Again, there was no difference between the groups for family structure ($p = 0.808$). However, adolescents in the Any-ADHD group had a significantly higher depression score than non-ADHD adolescents [mean (SD) 7.63 (4.93) vs. 5.39 (4.16), $U = 4751.00$, $p = 0.012$].

Possible ADHD status and prevalence of negative future expectations

The proportion of adolescents who believed that their chances of obtaining the examined future outcomes were either low or very low was significantly higher among those in the Any-ADHD group for all outcomes except good health [$p < 0.05$ (Fisher's Exact Test)] (Fig. 1).

ADHD symptoms and negative future expectations

The results from the logistic regression analysis examining the association between ADHD symptoms and negative future expectations (coded as 1/0) are presented in Table 1. In Model 1 higher ADHD-Inattentive scores were associated with significantly increased odds for five of the seven outcomes with odds ratios ranging from 1.09 for getting a well-paid job to 1.20 for graduating from high school. After further adjustment for sex and depressive symptoms (Model 2), inattention symptoms continued to be associated with significantly increased odds for negative future expectations in relation to two outcomes—graduating from high school (OR 1.14, 95% CI 1.07–1.22) and going to college (OR 1.09, 95% CI 1.03–1.16). The ADHD-Total symptoms score was also associated with significantly increased odds for negative future expectations about graduating from high school in Model 2 (OR 1.05, 95% CI 1.01–1.08), but was not associated with any other outcomes. The ADHD-Hyperactive symptoms score was not associated with any of the outcomes in the fully adjusted Model 2.

ADHD status and negative future expectations

When the association between having a possible ADHD status (measured as a categorical variable) and negative future expectations was examined in a logistic regression analysis, there was some overlap with the results from the symptoms analysis but also notable differences (Table 2). Specifically, as in the previous analysis, ADHD-Inattentive status was associated with significantly increased odds for negative expectations about graduating from high school in Model 2 (OR: 5.22, 95% CI: 1.35–20.14). However, unlike in the symptoms analysis, ADHD-Hyperactive status was significantly associated with several outcomes. Specifically, those children with a possible ADHD-Hyperactive status had significantly increased odds for negative future expectations about getting a well-paid job (OR: 3.86, 95% CI: 1.11–13.44), having a happy family life (OR: 4.02, 95% CI: 1.10–14.64) and succeeding in doing what is most important for them (OR: 5.68, 95% CI: 1.51–21.30) in the fully adjusted Model 2. Any-ADHD status was also associated with significantly increased odds for the same outcomes as the ADHD-Hyperactive status, i.e., those adolescents in the Any-ADHD group had significantly increased odds for negative future expectations relating to getting a well-paid job, having a happy family life and succeeding in doing what is most important for them with odds ratios ranging from 3.28 to 3.70 for these outcomes.

Discussion

This study examined the association between ADHD symptoms/possible ADHD status and negative future expectations relating to work, education and family in a sample of over 500 Russian adolescents. Results showed that ADHD symptoms/status was associated with a more pessimistic future outlook but these associations varied by

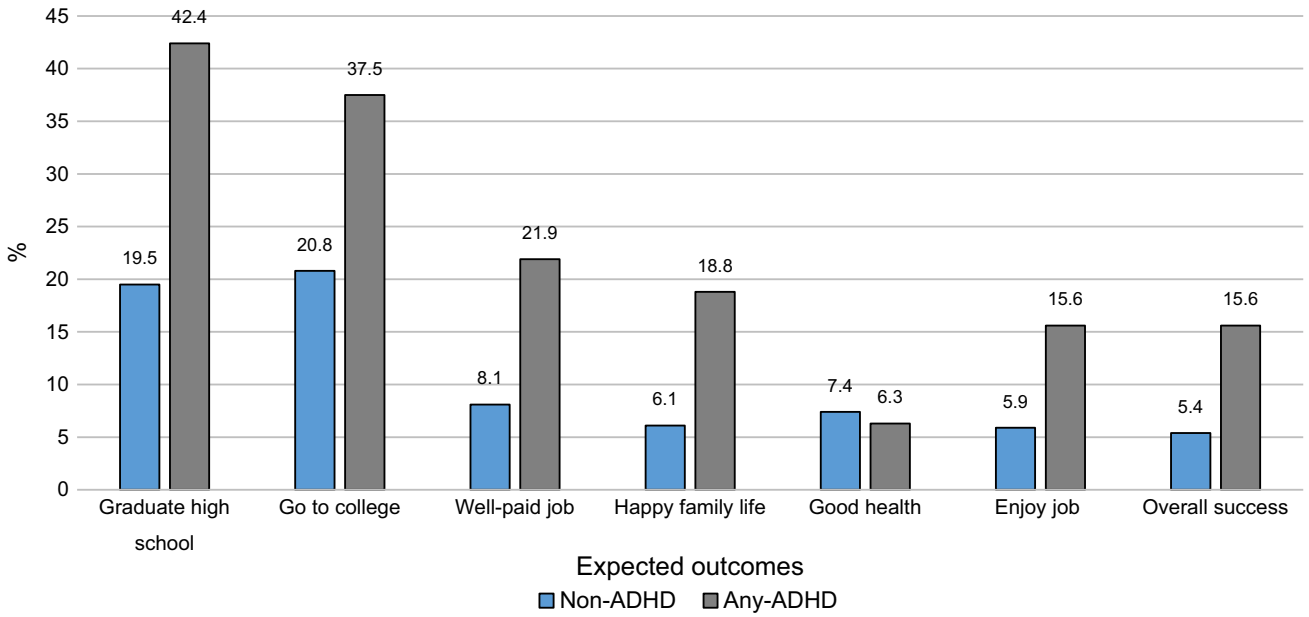

Fig. 1 Prevalence of negative future expectations in Any-ADHD and Non-ADHD adolescents. Negative expectations refer to the belief that one's chances of obtaining a particular outcome was either low or very low

Table 1 Association between ADHD symptom scores (continuous variable) and negative future expectations in Russian adolescents ($n = 537$)

	Graduate high school	Go to college	Get a well-paid job	Have a happy family life	Enjoy good health	Get an enjoyable job	Succeed in most important
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
ADHD type							
ADHD-Inattentive (score 0–18)							
Model 1	**1.20 (1.13–1.27)*** **	**1.12 (1.06–1.18)*** **	**1.09 (1.02–1.18)***	1.08 (1.00–1.18)	1.06 (0.98–1.15)	**1.12 (1.03–1.22)****	**1.11 (1.02–1.21)***
Model 2	**1.14 (1.07–1.22)*** **	**1.09 (1.03–1.16)****	1.08 (0.99–1.18)	1.03 (0.93–1.14)	1.02 (0.92–1.12)	1.08 (0.98–1.20)	1.06 (0.95–1.18)
ADHD-Hyperactive (score 0–18)							
Model 1	**1.06 (1.01–1.12)***	1.04 (0.98–1.09)	1.03 (0.96–1.11)	1.03 (0.95–1.12)	0.93 (0.84–1.04)	1.03 (0.95–1.12)	1.05 (0.97–1.14)
Model 2	1.03 (0.97–1.09)	1.02 (0.96–1.08)	1.04 (0.97–1.13)	1.03 (0.94–1.12)	0.93 (0.83–1.03)	1.03 (0.94–1.13)	1.04 (0.95–1.14)
ADHD-Total (score 0–36)							
Model 1	**1.07 (1.04–1.10)*** **	**1.04 (1.01–1.07)****	1.03 (0.99–1.07)	1.02 (0.98–1.07)	1.00 (0.95–1.05)	1.04 (0.99–1.09)	1.04 (0.99–1.09)
Model 2	**1.05 (1.01–1.08)****	1.03 (1.00–1.06)	1.03 (0.99–1.08)	1.01 (0.96–1.07)	0.98 (0.93–1.04)	1.03 (0.98–1.08)	1.03 (0.97–1.08)

ADHD attention deficit/hyperactivity disorder, ADHD-Total is a combined score where the inattention and hyperactivity scores have been added together, *OR* odds ratio, *CI* confidence interval

Model 1: adjusted for school; Model 2: adjusted for school, sex, depressive symptoms

Statistically significant results are marked in bold font; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

Table 2 Association between ADHD status (categorical variable) and negative future expectations in Russian adolescents ($n = 537$)

	Graduate high school	Go to college	Get a well-paid job	Have a happy family life	Enjoy good health	Get an enjoyable job	Succeed in most important
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
ADHD type							
ADHD-Inattentive							
Model 1	**5.24 (1.44–19.05)***	1.72 (0.44–6.83)	3.26 (0.65–16.42)	1.49 (0.18–12.39)	1.60 (0.19–13.27)	1.93 (0.23–16.11)	1.82 (0.22–15.23)
Model 2	**5.22 (1.35–20.14)***	1.70 (0.42–6.83)	3.04 (0.59–15.65)	1.61 (0.19–13.91)	1.37 (0.16–11.76)	1.71 (0.20–14.77)	1.62 (0.19–14.08)
ADHD-Hyperactive							
Model 1	2.38 (0.90–6.30)	2.50 (0.94–6.64)	**3.24 (1.02–10.36)***	**4.12 (1.28–13.33)***	0.73 (0.10–5.68)	3.20 (0.87–11.74)	**4.78 (1.47–15.57)****
Model 2	1.57 (0.48–5.09)	1.85 (0.60–5.70)	**3.86 (1.11–13.44)***	**4.02 (1.10–14.64)***	0.57 (0.07–4.89)	3.36 (0.81–13.89)	**5.68 (1.51–21.30)***
Any-ADHD							
Model 1	**2.80 (1.35–5.82)****	**2.46 (1.16–5.26)***	**3.37 (1.35–8.40)****	**3.23 (1.22–8.52)***	0.84 (0.19–3.69)	**3.05 (1.08–8.62)***	**3.14 (1.11–8.92)***
Model 2	2.27 (1.00–5.18)	2.00 (0.88–4.58)	**3.70 (1.40–9.82)****	**3.28 (1.13–9.48)***	0.68 (0.15–3.23)	2.96 (0.96–9.16)	**3.30 (1.06–10.31)***

ADHD attention deficit/hyperactivity disorder; Any-ADHD combines ADHD-Inattentive only cases, ADHD-Hyperactive only cases, and combined cases (i.e., children with both inattentive and hyperactive symptoms); *OR* odds ratio; *CI* confidence interval

Model 1: adjusted for school; Model 2: adjusted for school, sex, depressive symptoms

Statistically significant results are marked in bold font; *$P < 0.05$; **$P < 0.01$

symptom level, ADHD subtype, and across outcomes. In particular, after controlling for sex and depressive symptoms, a higher number of ADHD symptoms had little effect except for in relation to education, where total and inattentive symptoms were associated with significantly more negative expectations about finishing high school and going to college. When possible ADHD status was examined, inattention continued to be linked solely to a low expectation of educational success, whereas having a possible ADHD-Hyperactive status and being in the Any-ADHD status category was associated with negative future expectations relating to work, the family, and success in doing what is most important. These associations remained statistically significant even after controlling for worse mental health, which has previously been linked to poorer future expectations.

The finding that inattention was linked only to worse educational future expectations accords with the result from an earlier study that connected inattention to academic rather than global impairment (Lahey et al. 1994). It also agrees with more recent studies that have reported that inattention is either a stronger predictor of academic

impairment/difficulties than hyperactivity (Rodriguez et al. 2007; Sayal et al. 2015), or that it alone predicts academic underachievement (Jaekel et al. 2013; Pingault et al. 2011). It has been suggested that attention skills are associated with differences in academic outcomes as they predict either more or less time being spent on academic activities (Duncan et al. 2007). However, regardless of the specific way in which inattention affects academic outcomes, the fact that academic problems are manifest even in preschool children with ADHD (Loe and Feldman 2007) and that inattentive behavior at age 5 has been associated with worse academic performance at age 11 (Merrell et al. 2017), suggests that the negative future academic expectations of adolescents with higher ADHD inattentive/combined symptoms or who belonged to the inattentive ADHD subtype might be based on a history of academic difficulties and that rather than signifying pessimism, for some this might instead reflect a realistic evaluation of probable future outcomes.

Adolescents in the Any-ADHD and ADHD-Hyperactive status groups had significantly increased odds for rating their chances of having a happy family life as either low or very low. Although a number of previous studies have linked ADHD to an increased risk of marital dysfunction, this finding has not been universal (Johnston and Mash 2001). Moreover, there has been comparatively little research on the association between ADHD subtypes and family functioning. Nonetheless, as several previous studies have reported that there is an increased risk of family dysfunction/poorer family relations in the families of hyperactive children (Befera and Barkley 1985; McGee et al. 1984), as well as of parental disciplinary aggression (Woodward et al. 1998), it is possible that such factors might affect children's perceptions of family life and of what their own future family life might be like.

The reasons why children in the Any-ADHD and ADHD-Hyperactive status groups had negative expectations of future job outcomes and success in doing what is most important can only be speculated on, given the absence of previous research. For example, as there is some evidence that ADHD/ADHD symptoms may be more prevalent in parents of children with ADHD (Epstein et al. 2000; Johnston and Mash 2001) and that ADHD/ADHD symptoms have been linked to employment difficulties (Murphy and Barkley 1996) and impairment across a range of different domains (Das et al. 2012) in adults, it is conceivable that for some of these children their parents might be acting as negative role models and a source of pessimism about their own future possibilities.

This study has several limitations that should be mentioned. Given the small number of children with a possible ADHD status, it was not feasible to examine sex differences in these associations even though earlier research has indicated that future expectations may differ in boys and girls (Griffin et al. 2004; Iovu 2015). This also resulted in wide confidence intervals for some of the point estimates in the statistical analysis. We also assumed that all of the future expectations outcomes were desired. However, it is feasible, that for some children, going to college may not be part of their future career plans, so rating their own chances of attending as low or very low might not reflect negative future expectations but rather, different career aspirations. It is also possible that important variables were missing from the analysis. For example, besides academic history, we had no information on ADHD/ADHD symptoms in the parents/guardians of these children or of what the parents' expectations were for their children, both of which might have played a role in the observed associations.

In conclusion, this study has shown that adolescents with possible ADHD have higher odds for negative future expectations but that associations vary between ADHD subtypes with inattentive symptoms being primarily linked to higher expectations of future academic failure and hyperactivity to worse family and career outcomes. As positive future expectations have been associated with increased resilience in children (Wyman et al. 1993) and may be protective against potentially harmful outcomes such as substance use and delinquency (Prince et al. 2019) as well as promote positive youth development (Schmid et al. 2011), the results of this study are especially worrying. Given this, an important task for future research will be to determine the specific factors that are associated with negative expectations in children and adolescents with ADHD, if/how expectations change across time, and the interplay between parent and child expectations.

Funding AK's work was supported by the Miguel Servet contract financed by the CP13/00150 and PI15/00862 Projects, integrated into the National R + D + I and funded by the ISCIII—General Branch Evaluation and Promotion of Health Research—and the European Regional Development Fund (ERDF-FEDER). These organizations had no role in the study design, collection, analysis, and interpretation; in the writing of the manuscript; and in the decision to submit the paper for publication.

Compliance with ethical standards

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

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders, 5th edn. APA, Arlington

Befera MS, Barkley RA (1985) Hyperactive and normal girls and boys: mother-child interaction, parent psychiatric status and child psychopathology. J Child Psychol Psychiatry 26(3):439–452

Bourchtein E, Langberg JM, Owens JS, Evans SW, Perera RA (2017) Is the positive illusory bias common in young adolescents with ADHD? A fresh look at prevalence and stability using latent profile and transition analyses. J Abnorm Child Psychol 45(6):1063–1075

Christie D, Viner R (2005) Adolescent development. BMJ 330(7486):301–304

Das D, Cherbuin N, Butterworth P, Anstey KJ, Easteal S (2012) A population-based study of attention deficit/hyperactivity disorder symptoms and associated impairment in middle-aged adults. PLoS ONE 7(2):e31500

Dubow EF, Arnett M, Smith K, Ippolito MF (2001) Predictors of future expectations of inner-city children: a 9-month prospective study. J Early Adolesc 21(1):5–28

Duncan GJ, Dowsett CJ, Claessens A, Magnuson K, Huston AC, Klebanov P, Pagani LS, Feinstein L, Engel M, Brooks-Gunn J, Sexton H, Duckworth K, Japel C (2007) School readiness and later achievement. Dev Psychol 43(6):1428–1446

DuPaul GJ, Power TJ, Anastopoulos AD, Reid R (1998) ADHD Rating Scale-IV: checklists, norms, and clinical interpretation. Guilford, New York

Epstein JN, Conners CK, Erhardt D, Arnold LE, Hechtman L, Hinshaw SP, Hoza B, Newcorn JH, Swanson JM, Vitiello B (2000) Familial aggregation of ADHD characteristics. J Abnorm Child Psychol 28(6):585–594

Frazier TW, Youngstrom EA, Glutting JJ, Watkins MW (2007) ADHD and achievement: meta-analysis of the child, adolescent, and adult literatures and a concomitant study with college students. J Learn Disabil 40(1):49–65

Griffin KW, Botvin GJ, Nichols TR, Scheier LM (2004) Low perceived chances for success in life and binge drinking among inner-city minority youth. J Adolesc Health 34(6):501–507

Hallberg U, Klingberg G, Setsaa W, Moller A (2010) Hiding parts of one's self from others—a grounded theory study of teenagers diagnosed with ADHD. Scand J Disabil Res 12(3):211–220

Hurtig T, Ebeling H, Taanila A, Miettunen J, Smalley S, McGough J, Loo S, Järvelin MR, Moilanen I (2007) ADHD and comorbid disorders in relation to family environment and symptom severity. Eur Child Adolesc Psychiatry 16(6):362–369

Iovu MB (2015) Future expectations of senior high schoolers in Romania. Int J Adolesc Youth 20(4):518–527

Iovu MB, Hărăguş PT, Roth M (2018) Constructing future expectations in adolescence: relation to individual characteristics and ecological assets in family and friends. Int J Adolesc Youth 23(1):1–10

Isaksson J, Stickley A, Koposov R, Ruchkin V (2018) The danger of being inattentive—ADHD symptoms and risky sexual behaviour in Russian adolescents. Eur Psychiatry 47:42–48

Jaekel J, Wolke D, Bartmann P (2013) Poor attention rather than hyperactivity/impulsivity predicts academic achievement in very preterm and full-term adolescents. Psychol Med 43(1):183–196

Jensen CM, Steinhausen HC (2015) Comorbid mental disorders in children and adolescents with attention-deficit/hyperactivity disorder in a large nationwide study. Atten Defic Hyperact Disord 7(1):27–38

Jessor R, Donovan JE, Costa FM (1992) Rocky mountain middle/high school study health behavior questionnaire. Questionnaire guide. Institute of Behavioral Science, University of Colorado, Boulder

Johnston C, Mash EJ (2001) Families of children with attention-deficit/hyperactivity disorder: review and recommendations for future research. Clin Child Fam Psychol Rev 4(3):183–207

Kaplan BJ, Crawford SG, Fisher GC, Dewey DM (1998) Family dysfunction is more strongly associated with ADHD than with general school problems. J Atten Disord 2(4):209–216

Lahey BB, Applegate B, McBurnett K, Biederman J, Greenhill L, Hynd GW, Barkley RA, Newcorn J, Jensen P, Richters J et al (1994) DSM-IV field trials for attention deficit hyperactivity disorder in children and adolescents. Am J Psychiatry 151(11):1673–1685

Loe IM, Feldman HM (2007) Academic and educational outcomes of children with ADHD. J Pediatr Psychol 32(6):643–654

McGee R, Williams S, Silva PA (1984) Background characteristics of aggressive, hyperactive, and aggressive-hyperactive boys. J Am Acad Child Psychiatry 23(3):280–284

Merrell C, Sayal K, Tymms P, Kasim A (2017) A longitudinal study of the association between inattention, hyperactivity and impulsivity and children's academic attainment at age 11. Learn Individ Differ 53:156–161

Murphy K, Barkley RA (1996) Attention deficit hyperactivity disorder adults: comorbidities and adaptive impairments. Compr Psychiatry 37(6):393–401

Nguyen QC, Hussey JM, Halpern CT, Villaveces A, Marshall SW, Siddiqi A, Poole C (2012a) Adolescent expectations of early death predict young adult socioeconomic status. Soc Sci Med 74(9):1452–1460

Nguyen QC, Villaveces A, Marshall SW, Hussey JM, Halpern CT, Poole C (2012b) Adolescent expectations of early death predict adult risk behaviors. PLoS ONE 7(8):e41905

Nurmi JE (1991) How do adolescents see their future? A review of the development of future orientation and planning. Dev Rev 11(1):1–59

Nurmi JE (2005) Thinking about and acting upon the future: development of future orientation across the life span. In: Strathman A, Joireman J (eds) Understanding behavior in the context of time. Theory, research, and application. Lawrence Erlbaum Associates, Publishers, Mahwah, pp 31–57

Pingault JB, Tremblay RE, Vitaro F, Carbonneau R, Genolini C, Falissard B, Côté SM (2011) Childhood trajectories of inattention and hyperactivity and prediction of educational attainment in early adulthood: a 16-year longitudinal population-based study. Am J Psychiatry 168(11):1164–1170

Power TJ, Costigan TE, Leff SS, Eiraldi RB, Landau S (2001) Assessing ADHD across settings: contributions of behavioral assessment to categorical decision making. J Clin Child Psychol 30(3):399–412

Prince DM, Epstein M, Nurius PS, King K, Gorman-Smith D, Henry DB (2016) Assessing future expectations of low-income minority young men: survival-threats and positive expectations. J Child Fam Stud 25(7):2089–2101

Prince DM, Epstein M, Nurius PS, Gorman-Smith D, Henry DB (2019) Reciprocal effects of positive future expectations, threats to safety, and risk behavior across adolescence. J Clin Child Adolesc Psychol 48(1):54–67

Radloff LS (1977) The CES-D Scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1(3):385–401

Raffaelli M, Koller SH (2005) Future expectations of Brasilian street youth. J Adolesc 28(2):249–262

Rodriguez A, Järvelin MR, Obel C, Taanila A, Miettunen J, Moilanen I, Henriksen TB, Pietiläinen K, Ebeling H, Kotimaa AJ, Linnet KM, Olsen J (2007) Do inattention and hyperactivity symptoms equal scholastic impairment? Evidence from three European cohorts. BMC Public Health 7:327

Ruchkin V, Schwab-Stone M, Vermeiren R (2004) Social and Health Assessment (SAHA): psychometric development summary. Yale University, New Haven

Ruchkin V, Lorberg B, Koposov R, Schwab-Stone M, Sukhodolsky DG (2008) ADHD symptoms and associated psychopathology in a community sample of adolescents from the European north of Russia. J Atten Disord 12(1):54–63

Sasser TR, Kalvin CB, Bierman KL (2016) Developmental trajectories of clinically significant attention-deficit/hyperactivity disorder (ADHD) symptoms from grade 3 through 12 in a high-risk sample: predictors and outcomes. J Abnorm Psychol 125(2):207–219

Sayal K, Washbrook E, Propper C (2015) Childhood behavior problems and academic outcomes in adolescence: longitudinal population-based study. J Am Acad Child Adolesc Psychiatry 54(5):360–368

Schmid KL, Phelps E, Lerner RM (2011) Constructing positive futures: modeling the relationship between adolescents' hopeful future expectations and intentional self regulation in predicting positive youth development. J Adolesc 34(6):1127–1135

Scholtens S, Rydell AM, Yang-Wallentin F (2013) ADHD symptoms, academic achievement, self-perception of academic competence and future orientation: a longitudinal study. Scand J Psychol 54(3):205–212

Sipsma HL, Ickovics JR, Lin H, Kershaw TS (2015) The impact of future expectations on adolescent sexual risk behavior. J Youth Adolesc 44(1):170–183

Steinberg L, Morris AS (2001) Adolescent development. Annu Rev Psychol 52:83–110

Thompson R, Wiley TRA, Lewis T, English DJ, Dubowitz H, Litrownik AJ, Isbell P, Block S (2012) Links between traumatic experiences and expectations about the future in high risk youth. Psychol Trauma 4(3):293–302

Valadez-Meltzer A, Silber TJ, Meltzer AA, D'Angelo LJ (2005) Will I be alive in 2005? Adolescent level of involvement in risk behaviors and belief in near-future death. Pediatrics 116(1):24–31

Woodward L, Taylor E, Dowdney L (1998) The parenting and family functioning of children with hyperactivity. J Child Psychol Psychiatry 39(2):161–169

Wyman PA, Cowen EL, Work WC, Kerley JH (1993) The role of children's future expectations in self-system functioning and adjustment to life stress: a prospective study of urban at-risk children. Dev Psychopathol 5(4):649–661