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Early High School Engagement in Students with ADHD

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ABSTRACT

Background: Students with Attention/Deficit Hyperactivity Disorder (ADHD) continue to languish behind their peers with regard to academic achievement and education attainment. School engagement is potentially modifiable, and targeting engagement may be a means to improve education outcomes.

Aims: To investigate school engagement for students with ADHD during the crucial high school transition period and to identify factors associated with low school engagement.

Sample: Participants are adolescents (12-15 years) in the first and third year of high school with diagnosed ADHD (n=130). Participants were recruited from 21 paediatric practices.

Methods: Cross-sectional study assessing school engagement. Data were collected through direct assessment and child, parent and teacher surveys. School engagement is measured as student attitudes to school (cognitive and emotional) and suspension rates (behavioural). Multivariable regression analyses examined student, family and school factors affecting engagement.

Results: In comparison to state data**,** students with ADHD in the first year of high school were less motivated ($p<0.01$) and less connected to peers ($p<0.01$). Overall, there was no discordance in third year attitudes. There were high rates of suspension in both years (21% vs 6%, $p<.01$). Explanatory factors for poor attitudes include adolescent depression, poor adolescent supervision, and devaluing education. Conduct problems and increased hyperactivity were related to increased likelihood of being suspended, while higher cognitive ability, family SES and independent schools reduced risk.

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Conclusions: Potentially modifiable individual and family factors including adolescent depression, behavioural problems, education values and family supervision could be targeted to better manage the high school transition for students with ADHD.

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Early High School Engagement in Students with ADHD

Attention/Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder prevalent in 5% of school-aged children (Polanczyk, De Lima, Horta, Biederman, & Rohde, 2007). ADHD is associated with persistent behavioural and social impairments (Becker, Luebbe, & Langberg, 2012). School problems are also common, including academic underachievement and early school dropout, which can have lifelong consequences (Barkley, 2002; Daley & Birchwood, 2010; DeShazo-Barry, Lyman, & Klinger, 2002), including unemployment, delinquency, substance use, and mental health problems (Henry, Knight, & Thornberry, 2012). Despite treatment of ADHD with stimulant medication and behavioural interventions, long term education outcomes are not greatly improved (Langberg & Becker, 2012). School completion and higher education rates continue to be low for young people with ADHD and so improving educational outcomes remains a priority (Loe & Feldman, 2007).

School engagement conceptualises the way in which students identify with and participate with school and learning, and is an emerging determinant of education success. It is a multi-faceted construct, encompassing dimensions of cognitive, emotional and behavioural engagement (Fredricks, Blumenfeld, & Paris, 2004; Hanewald, 2013). Cognitive aspects incorporate cognitions around willingness and motivation to learn, as well as self-regulation (i.e. the time and effort put into learning). Emotional aspects include a student's feelings toward school, a sense of belonging, feelings of connectedness to peers and participation in daily school life. Suspension from school is seen as a behavioural indicator of student disengagement and can be a pathway to early school leaving, anti-social behaviour and delinquency (ARACY, 2008; Archambault, Janosz, Morizot, & Pagani, 2009). Students' with strong emotional and behavioural connections to school are likely to experience greater academic success and are less likely to leave school early (Henry et al., 2012).

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Early high school is a time of intense growth, development, and transition and likely a 'make or break' period for defining students' engagement at school. It is common for students to experience a small decline in attitudes to school over this period. Student social and emotional connections to school are weakest in year 9, but generally remain positive (Department of Education and Training, 2010). Low school engagement during this period, as reported on self measures of school engagement, have been found to be related to the increased likelihood of early school leaving, poorer long term education and occupational outcomes independent of demographic background factors (Abbott-Chapman et al., 2014). The transition to high school may result in additional challenges for students with ADHD as they grapple with increased academic, social and organisational demands (Langberg et al., 2008). Deficits in functioning and learning skills may compound problems and further decrease motivation and self-esteem as tasks become more complex and greater effort is required (Hoza, Pelham, Waschbusch, Kipp, & Owens, 2001).

Studies investigating school engagement in general student populations have found a number of factors correlated with lower student engagement, including gender (being male), socioeconomic disadvantage, as well as family and school level factors. For example, a cross sectional study examining the association between SES and student self-reported suspensions showed that students in medium SES (odds ratio 0.6, $p<0.05$) and high SES (OR 0.3, $p<0.05$) communities were protected against the likelihood of being suspended from school, after taking into account age, gender and family functioning (S. Hemphill et al., 2010). Young people from low SES background are one-third as likely as those from high SES backgrounds to undertake higher education. Research has shown that differing aspirations and attitudes during high school predict high school completion, achievement, and progression to university (James, 2000). These attitudes and aspirations may also stem from family values and norms including inadequate parent supervision and monitoring, low educational expectations and low parent education (ARACY, 2008; S. A. Hemphill, Plenty, Herrenkohl, Toumbourou, & Catalano, 2014; Henry et al., 2012; James, 2000)

There is evidence that school-level factors may bear some influence on student outcomes. For example, a disproportionate number of early school leavers (42%) are from schools located outside of metropolitan areas (Lamb, Jackson, Walstab, & Huo, 2015). Government schools and schools in more remote locations have been shown to have a higher concentration of lower socio-economic status (SES) families and fewer resources which may reflect differing outcomes (Human Rights and Equal Opportunity Commission, 2000). For

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example, odds of suspension are increased three fold for public school students, and students attending a public school are more likely (OR 6.8) to exhibit lower commitment to school in comparison to students attending private schools (S. A. Hemphill et al., 2014).

However, it is unclear if these child, family, and school level factors are associated with poor engagement in students with ADHD. Much less research has investigated school engagement in high school students with ADHD and this research has tended to focus on school engagement as a predictor of academic functioning rather than an outcome in its own right. Two longitudinal prospective studies included measures of attendance, truancy and disciplinary problems (i.e. suspension) as predictors of academic achievement (Kent et al., 2011; Molina et al., 2009). One of these studies included only boys (Kent et al., 2011), and the other excluded children with predominately inattentive symptoms of ADHD (Molina et al., 2009). Both studies showed that behavioural engagement was an important construct in explaining academic achievement for students with ADHD. Other important aspects of engagement, including the student's own educational attitudes, beliefs, and values, were not measured.

ADHD core symptoms, particularly inattentive symptoms, hyperactivity, impulsiveness and deficits in cognition (i.e. working memory, lower intelligence) (DeShazo-Barry et al., 2002; Frazier, Demaree, & Youngstrom, 2004; Massetti et al., 2008) have been shown to interfere with learning, and good learning habits including intrinsic motivation, self-direction, organisation and planning, as well as sustained effort and appropriate behaviours including on-task behaviours within the classroom (Barkley, 2006; Volkow et al., 2011). These ineffective learning skills may lead to lower achievement and poorer self-esteem, which increases the risk of becoming disengaged from school.

There is a high comorbidity between ADHD and a number of other disorders including internalizing problems (i.e. depression and anxiety) (Massetti et al., 2008), externalizing behaviours (i.e. conduct problems), learning disorders, poorer emotional regulation, social deficits (i.e. peer problems and bullying) (Lyndal Bond, Carlin, Thomas, Rubin, & Patton, 2001; Daley & Birchwood, 2010; DeShazo-Barry et al., 2002) that also interfere with learning and further exacerbate problems at school. Inappropriate and disruptive behaviours can lead to disrupted learning and poorer student-teacher relationships (Daley & Birchwood, 2010). Peer relationships and friendships are important factors in promoting or impeding engagement with school (Woodward & Fergusson, 2000). Students

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who are unable to establish friendships and work cooperatively with others face social rejection and isolation and potentially greater peer conflict and higher rates of bullying, impacting a students' sense of connectedness and belonging (Timmermanis & Wiener, 2011). Poor overall academic achievement, as well as specific learning disorders, may also negatively influence learning confidence, self-esteem and exacerbate behaviour problems (Smith & Adams, 2006), which is likely to lead to a student feeling less connected to school.

We, therefore aimed, in a cohort of students with ADHD in their first and third year of high school to (i) describe school engagement in comparison to state-wide data from same year cohorts; and (ii) investigate child, family and school level factors associated with student attitudes to school and suspension rates. We hypothesized that students with ADHD would have lower school engagement as evidenced by poorer attitudes to school and higher rates of school suspension compared to their peers (state benchmarks) and that potentially modifiable risk and protective factors for school engagement would exist.

METHODS

Ethical approval and consent

The [***removed details for anonymity***] granted ethics approval. Informed written parental consent was obtained including consent to contact the child's teacher. Students gave written consent on the day of the home visit. Teacher completion of the online survey implied consent.

Participants

Participants were students in the first or third year of high school (years 7 and 9 in Australia), drawn from an existing sample of children (n=392) with diagnosed ADHD. Participants were recruited on average 3.0 (SD: 0.7) years prior, from paediatrician practices. [***removed details for anonymity***].

Eligibility and recruitment

Participants were eligible if they were in either the first or third year of high school during recruitment (wave 1 in 2014, wave 2 in 2015). The study methodology is described elsewhere (***removed***). Briefly, participants were drawn from a larger longitudinal study conducted in 2010-2012 investigating behavioural sleep problems in children aged 5-12 years, comprising children with parent-reported moderate/severe (N=244) and no/mild

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(N=144) sleep problems. A research assistant confirmed ADHD diagnosis during a recruitment call in accordance with the DSM-IV criteria including an assessment of current ADHD symptoms on the ADHD Rating Scale (DSM-IV) (Dupaul, Power, Anastopoulos, & Reid, 1998), confirmation of cross situational impairment, the level of impairment, and age of onset. Baseline exclusion criteria included: (1) parents with insufficient English to complete surveys; (2) children with a significant medical condition (e.g. cerebral palsy or an intellectual disability (IQ<70); (3) children with suspected sleep apnea; and (4) children receiving specialist sleep intervention at the time of the study.

Procedure

For the present study, [***removed details for anonymity***] participants who were enrolled at the 12-month follow-up (n=349) were assessed for eligibility of whom 105 were outside the transition period, 30 opted out of learning more about the study, and 14 were uncontactable. Of the remaining 200 eligible families, 130 were enrolled with the remainder either uncontactable (n=5) or not interested (n=65). Eligible families who enrolled did not differ from eligible families who did not enrol on baseline measures of child age, gender, ADHD symptoms, medication use, and SES.

Data were collected through face-to-face home visits with families. Surveys about student behaviour, school functioning, social emotional health, and demographics were completed by the parent and students separately at the visit. Consent was obtained from 119 families for the research team to contact the child's teacher, of whom 107 teachers (90%) completed a brief online survey about their student's academic performance, behaviour, and functioning at school.

Measures

School engagement

Student attitudes to school were measured on three subscales: student motivation (4 items), connectedness to peers (4 items) and connectedness to school (5 items). Students self-rated items on a 5 point Likert scale (1=strongly disagree to 5=strongly agree). Higher scores indicate greater engagement. Cronbach's alpha (α) ranged from .85 to .89. Subscale totals were summed to form a composite attitude score (outcome). Subscales are reproduced from the annual Attitudes to School Survey for school students in Years 5–12, and 2015 results are

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referenced as state benchmarks (***removed details for anonymity)***. This survey was completed by 92,000 year 7 and 9 students.

Suspension was measured by school records accessed by the child's teacher. Teachers reported whether the child had been suspended or expelled at least once in the current school year to form a dichotomous measure of school suspension. Schools are required to report on every student at least twice a year using common student reporting which includes achievement and attendance data. State reference data for school suspension by year were provided by the [***removed details for anonymity***].

Explanatory Variables

A range of student, family and school-level *explanatory variables* were measured a priori based on the current literature regarding risk and protective factors for school engagement or academic achievement (see Table 1). This table provides a summary of each measure and more extensive details and references are described elsewhere [***removed details for anonymity***].

Insert table 1

Analyses

Comparison of sample means to state benchmark means on school engagement outcomes were conducted using t-tests (aim 1), with the significance level at .05. Multivariable regression was then conducted to examine student, family, and school explanatory variables associated with engagement outcomes (aim 2). Potential explanatory variables were included in the study design and analysis on the basis of prior clinical knowledge and evidence from the literature. Correlations between explanatory variables are available (see Table S1). First, a series of univariable regression analyses examined the association between each explanatory variable and each outcome. Variables associated with the outcome at the level $p<0.10$ were subsequently included in the regression models (Walter & Tiemeier, 2009). We also examined early and current sleep group status which may confound results and found no significant association with attitudes or suspension. We

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standardized continuous explanatory variables to have a mean of 0 and standard deviation of 1 for use in regression models examining both student attitudes toward school and suspension.

Linear regression was used to model attitudes to school estimating the standardized coefficient, 95% confidence intervals (CI), p-values, and R^2 for model fit. The initial model examined child variables; subsequently child, family and school variables were included. For the outcome of the Short Moods and Feelings Questionnaire (SMFQ), 1 item was inadvertently left off the survey. We repeated our analyses with 'imputed' data for the missing item (item 10 'I felt lonely') based mean score from the completed 12 items but found no meaningful difference in our results. We report outcomes based on the 12 item score.

Logistic regression was used to model suspension rates estimating odds ratios (OR) and 95% CI. Explanatory variables (including SES) were considered individually, then controlled for child age, gender, and medication use. Insufficient sample size precluded more complex logistic regression models. Analyses were conducted using Stata 13.1 (Stata Corp LP, USA).

Attach supplementary table S1

RESULTS

Sample characteristics

Sample characteristics are shown in Table 2. The mean age of participants was 13.7 years and most were male (89%) and taking ADHD medication (72%). Respondents included parents of whom 95% were mothers, and high school teachers of whom 61% were the student's Homeroom teacher. Students were from 112 different government (59%), independent (15%), Catholic (20%) and other special educational sectors (6%) throughout [***removed details for anonymity***], which is similar to the state spread (Department of Education and Training, 2015).

Insert table 2

School Engagement

A comparison of ADHD student versus state benchmarks for attitudes on school connectedness, connectedness to peers, student motivation, and suspension, are shown in Table 3, stratified by year. First year high school students with ADHD reported being less

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connected to peers, (p =0.01) and less motivated towards school in comparison to benchmarks (p=<0.01). In contrast, third year students with ADHD reported greater school connectedness in comparison to benchmarks (p=<0.01) and similar levels to the state benchmarks for both connectedness to peers and motivation. Suspension rates (21%) were over three times higher than the state reported rate of 6% in 2015, (p<.001).

Insert table 3

Factors Associated with Engagement

A number of variables were associated with attitudes to school at the univariable level, including student academic functioning, IQ, inattentive and hyperactive ADHD symptoms, conduct and emotional problems, adolescent depression, valuing education, being bullied and poor family management (see Table 4). Results from the multivariable models showed potentially modifiable factors including adolescent depression, not valuing education and poor family management, were associated most strongly with poorer student attitudes to school. For example, with each one SD higher total adolescent depression score, attitude scores were 4.64 points lower (95% CI: -6.21 to -3.28, p<.001), and this association held after full adjustment for all associated factors at the bivariate level (b= -3.38, 95% CI: -5.30 to -1.48, p<.01). Results can also be viewed for each of the attitude subscales (see Table S2).

Insert table 4, Attach supplementary table S2.

A number of explanatory variables were associated with school suspension (see Table 5). After adjustment for child age, gender, medication use and SES (SEIFA), increased hyperactivity (OR 2.15, 95% CI 1.10 to 4.18, p=.03) and conduct problems (OR 2.73, 95% CI 1.45 to 5.15, p<.01) increased the odds of being suspended (model 2). However, higher intelligence (OR 0.46, 95% CI 0.22 to 0.95, p=.04), higher SES background (OR 0.51, 95% CI 0.31 to 0.83, p<.01) and attending an independent school (OR 0.21, 95% CI 0.04 to 0.85 to 5.5, p=.02) decreased the odds. Prior to controlling for SES (model 1) there was a strong inverse association between academic functioning and suspension (OR 0.52, 95% CI 0.28 to 0.95 to 5.5, p=.03) and students attending schools in provincial areas were four times more likely to be suspended (95% CI 1.3 to 12.0, p=.02) than students attending schools in metropolitan areas. However, these associations are somewhat attenuated when controlling for SES, suggesting some of the variability is explained by SES.

Insert table 5

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DISCUSSION

With respect to cognitive and emotional engagement, students with ADHD were less engaged in their first but not third year of high school compared with state benchmarks. However, students in both years were at markedly increased risk of suspension. Poor student attitudes to school were most strongly associated with depression, beliefs about the long term value of education, and poor family management practices. Increased student suspension was associated with greater hyperactivity and conduct symptoms and lower SES, whilst decreased suspension was associated with higher intelligence and attending an independent school.

Our results show a great deal of heterogeneity with regard to attitudes held towards peers, school, and motivation. We could find no other paper examining this issue in children with ADHD. This in part dispels the stereotypical beliefs held by some that ADHD is synonymous with poorer attitudes toward school. There was only a modest relationship with school engagement and academic performance and that relationship was tempered by the inclusion of other individual and family factors.

Whilst many children with ADHD are reporting high levels of school engagement, some do not and represent a subgroup at risk of early school dropout. Furthermore, students with ADHD in the first year of high school reported overall less favourable attitudes towards peers and lower motivation for learning than their classmates. It is well known that young people with ADHD have impairments that may impact their social adjustment (Barkley, Fischer, Smallish, & Fletcher, 2006; Wehmeier, Schacht, & Barkley, 2010) and problems with motivation on low interest tasks, organizational skills and homework management (Barkley, 2006). The increased social and academic demands of high school may exacerbate these problems as children transition from primary school and cause some children to have lower self-efficacy in their academic and social abilities.

We could find no published studies examining school connectedness for students with ADHD in mid-adolescence. Our finding that students with ADHD in their third year of high school did not differ in their school connectedness (a subscale of the attitudes towards school composite) compared with state-wide data may reflect the fact that less connected students have dropped out of school or are less likely to take part in research. Alternatively, students with ADHD may be able to pursue subjects that are of greater interest or less academically focused, which may positively influence attitudes.

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The odds of being suspended were nearly three times higher in comparison to state benchmarks, which is consistent with high rates of suspension for adolescents with ADHD, particularly for males, reported in previous research (Bauermeister et al., 2007; Loe & Feldman, 2007). This is particularly troubling, given suspension is linked to a number of negative consequences, including increased disengagement from school, disruption to learning, and escalating behavioural problems (S. Hemphill et al., 2010; S. A. Hemphill et al., 2014; Henry et al., 2012). It may be that students with ADHD find the transition to high school particularly stressful and that ADHD symptoms may for a period of time escalate, (Langberg et al., 2008) resulting in increased inappropriate and disruptive behaviour.

The finding that greater depressive symptoms and poor family management (i.e. poorer adolescent monitoring and supervision) were associated with worse attitudes to school in the adjusted models is novel. Depression commonly co-occurs in adolescents with ADHD and has been related to negative self-perceptions and beliefs, which are likely to be reflected in attitudes to school (Jensen, Shervette, Xenakis, & Richters, 1993; Ostrander, Crystal, & August, 2006). Ineffective parental practices and discipline have previously been identified as a risk factor for a range of negative adolescent behaviours in the general population including school disengagement (S. A. Hemphill et al., 2014; Henry et al., 2012). Parenting skills have also been found to influence high school success in adolescents with ADHD (Latimer et al., 2003).

We found that the likelihood of being suspended was increased for students that exhibited higher levels of conduct and hyperactivity symptoms and lower intelligence. Consistent with existing research in general high school student populations, we found risk was also higher for students from lower SES households, those attending government schools and those with poorer academic functioning (S. Hemphill et al., 2010; S. A. Hemphill et al., 2014). In our study the latter was partly explained by SES.

Our study has a number of strengths. We included a comprehensive examination of student, family and school level factors related to school engagement. Child ADHD diagnosis was confirmed at initial recruitment and multi-informant data were collected. Our primary outcome measures were validated for adolescent populations (although data on the convergent and divergent validity of the ATS are not available) and had normed reference data or population level benchmarks' (i.e. ATS Survey) (Department of Education and

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Training, 2015) available for comparison. The sample was representative of a range of SES families, differing cognitive abilities and varied school sectors.

Our study had some weaknesses. It was cross sectional so we cannot assume causality. We did not have a control group and instead used state-wide comparative data which will include adolescents with ADHD. Our results therefore likely underestimate the differences between adolescents with ADHD and their peers. We excluded families with insufficient English and children with an IQ < 70 so results may not generalize to these families. We relied on teacher report of student suspension which may have been influenced by a student's behaviour and attitude towards that teacher. Obtaining an objective measure of learning disabilities in this study was not feasible, even though learning disorders are likely to influence engagement. We tried to minimize reporting bias by targeting teachers that had access to student records (i.e. Homeroom teachers) and by surveying teachers immediately after mid-year compulsory reporting. The small number of female participants prevented us from examining gender differences in engagement.

The high school transition period has been identified as a particularly critical period for the development of student attitudes, values, and beliefs that may influence a students' education trajectory (Hanewald, 2013; Henry et al., 2012). Our study has highlighted the importance of viewing engagement as a school outcome in its own right. Promoting school engagement over the high school transition period may be key to keeping students with ADHD engaged in their high school education. Students entering the first year of high school may benefit from additional social and learning support as they adapt to their new school environment, and strategies to reduce rates of suspension in high risk students seem particularly pertinent to addressing the high rates of disengagement and school dropout in students with ADHD.

Our study has identified a number of potentially modifiable factors for low school engagement and suspension. Although our study cannot determine causality, prospective research should follow a cohort of children with ADHD to determine whether adolescent depression, externalising behaviours, devaluing of education and poor family management proceeds low school engagement or vice versa. Regardless, addressing factors associated with low motivation to learn - e.g. optimizing organizational skills and promoting positive learning experiences in primary school - may improve student attitudes toward learning. Supporting students to develop new friendships early in the transition to high school may also

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be important for a positive transition experience. In the meantime, clinicians, parents, and educators can leverage this information to assist in developing a transition plan for students with ADHD as they make this critical move to high school.

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Table 1

Explanatory Variables for Engagement

Constructs	Measures	Source
Child		
Demographics	**Child age, gender,** and **school year** were collected from the current parent survey.	parent
IQ	**Wechsler Abbreviated Scale of Intelligence™ (WASI-II)** is a validated measure of child IQ. We estimate IQ using two subsets, vocabulary and matrix reasoning subtests (FISQ-2). Mean 100, SD 15, range "*extremely low*" (<69) to "*very superior*" (>130) (Wechsler, 1999).	direct
Academic functioning	**Wide Range Achievement Test 4 (WRAT 4)** (Wilkinson & Robertson, 2006) is a validated assessment of academic ability. Word reading and mathematical computation subtests were administered. Mean 100, SD 15. Scores are averaged for an overall rating of academic functioning.	direct
ADHD Symptoms	**ADHD Rating Scale IV** (Dupaul et al., 1998), an 18-item validated scale measuring inattention (9 items; α = 0.88) and hyperactivity (9 items; α = 0.90) symptoms. Higher scores reflect more severe symptoms. Range 0 to 27.	parent
Medication use	**ADHD medication** use was assessed using a single item. Parents were asked if the child currently used ADHD medication (yes/no).	parent
Problem behaviour	**Strengths and Difficulties Questionnaire (SDQ***)* (Goodman, 2001) a 25-item validated measure of behavioural and emotional problems We report emotional (α = 0.73) and conduct problems (α = .75) subscales. Higher scores reflect more difficulties, range 0 to 10.	parent
Depression	**Short Version Moods and Feelings Questionnaire (SMFQ),** is a validated 13-item scale used to assess child/adolescent depression symptoms over the past two weeks (α = 0.88) (Messer et al., 1995). Higher scores indicate greater depressive symptoms. We report 12 items, range 0 to 23.	child
Bullying	**Gatehouse Bullying Scale** is a validated 12-item measure of covert and overt victimization. Responses were dichotomized into a single variable, capturing if the child had experienced bullying on at least one occasion in the assessment year. Data were dichotomised as Bullied 'no' = Gatehouse category not bullied; bullied 'yes'= all three Gatehouse bullied categories; infrequent/frequent and not upset/frequent and upset (L. Bond, Wolfe, Tollit, Butler, & Patton, 2007).	child
Self-regulation	**Affective Reactivity Index (ARI)** (Stringaris et al., 2012)is a 6- item validated measure of irritable behaviour (e.g., "loses his/her temper easily"). Items are	parent

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	rated on a 3-point scale and summed to give a total (0-12). Higher scores reflect greater irritability/lower self-regulation (α = 0.90).	
Valuing education	**Valuing education** is a single item measure. Students' were asked to rate the extent to which they thought that learning at school is important to later life, on a 5-point scale from '*very important'* or *'not important at all'*. Answers were dichotomised values education (yes or no),'yes/no' at very/quite v's 'no' at fairly/slightly/not at all, as per previous research (L. Bond, Thomas, Toumbourou, Patton, & Catalano, 2000).	child
Puberty	**Pubertal Development Scale (PDS)** (Petersen, Crockett, Richards, & Boxer, 1988), a 5-item, gender specific self-assessment of physical maturation and pubertal status in adolescents. Higher scores represent greater maturation. Boys (α = 0.80), girls (α = 0.85).	child
Family/ School		
Parent mental health	**Depression Anxiety Stress Scale (DASS)**, a 21-item validated and reliable assessment of adult mental health. We report on the total DASS scale (*α* = 0.94) (Lovibond & Lovibond, 1995).	parent
Family management	**Poor Family Management** (**PFM**) (L. Bond et al., 2000) scale is a 9-item adolescent self-report measure about family rules and supervision (e.g. my family has clear rules about alcohol and drug use). It has been validated as a family risk factor for adolescent behavioural problems (α = 0.78). Higher scores indicated greater risk.	child
School level variables	**School location** (metropolitan vs provincial) and **school sector** (government vs non-government (Catholic, independent, other)) are obtained for each individual school by linking to data published on the '*My School'* website (Australian Curriculum Assessment and Reporting Authority, 2015).	linked
Socio-economic Status	***S*ocio-Economic Indexes for Areas *(*SEIFA*)*** index of disadvantage **,** which links to the postcode of the family residence is used as an area level indicator of SES (Australian Bureau of Statistics, 2011).	linked

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Table 2

Sample Characteristics

Sample Characteristics[a]	M (SD), Range
Child	
Age in years	13.7 (1.1), 12-16
Male, n (%)	116 (89)
ADHD medication use, n (%)	93 (72)
First year of high school (year 7), n (%)	86 (66)
Pubertal stage (PDS) [b]	2.9 (0.9), 1-5
IQ (WASI, FISQ-2) [c]	100.4 (15.8), 64-143
Academic functioning (WRAT) [d]	95.62 (14.4), 58-135
Reading	102.2 (19.1), 56-145
Math	89.0 (13.4), 60-125
ADHD - inattentive (ADHD-RS-IV) [e]	17.8 (5.4), 2-27
ADHD- hyperactive/impulsive (ADHD-RS-IV) [f]	13.1 (5.8), 0-25
Conduct problems (SDQ) [g]	3.7 (2.4), 0-10
Emotional problems (SDQ) [h]	4.4 (2.6), 0-10
Bulled in current year, n (%)[i]	54 (44)
Self-regulation (ARI) [j]	3.6 (3.0), 0-12
Adolescent depression (SMFQ) [k]	5.0 (4.3), 0-23
Values education, n (%)	58 (51)
Parent and family	
Mothers, n (%)	124 (95)
Parent mental health (DASS) [l]	15.2 (13.3), 0-59
Poor family management (PFM) [m]	3.95 (4.2), 0-18
Socio economic status (SEIFA) [n]	1011 (67), 817-1114
School environment [o]	
Sector – government, n (%)	84 (66)
Location - metro, n (%)	97 (75)

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[a] n ranges between 111 and 130; [b] PDS, Pubertal Development Scale; [c] Wechsler Abbreviated Scales of Intelligence, Full scale IQ 2 (FISQ2); [d] Wide Range Achievement Test 4 (WRAT4) – word reading and math computation subscales; [e] ADHD-RS-IV symptoms of inattention, parent report; [f] ADHD-RS-IV symptoms of hyperactivity-impulsivity; [g] SDQ conduct subscale; [h] SDQ emotions subscale; [i] Gatehouse Bullying Scale dichotomised into bullied yes/no; [j] Affective Reactivity Index (ARI), parent reported; [k] Short Moods and Feelings Questionnaire (SMFQ), self-report; [l] Depression Anxiety Stress Scales (DASS-21), parent; [m] Poor Family Management (PFM);self- report [n] Socio-Economic Indexes For Areas (M:1000, SD:100); [o] School sector - state government/independent; School location metropolitan/provincial.

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Table 3

Comparison of School Engagement in First and Third Year Students with ADHD to Benchmarks

	Year 7				Year 9			
Attitudes to School scale[a] (mean scores and standard deviations)[b]	**ADHD mean**	**SD**	**State mean**	**P**	**ADHD mean**	**SD**	**State mean**	**P**
School Connectedness *Extent to which students feel they belong and enjoy attending school*	4.01	0.80	4.10	0.36	**3.86**	0.77	**3.50**	**<0.01**
Connectedness to Peers *Extent to which students feel socially connected and get along with their peers*	**3.90**	**0.81**	**4.20**	**<0.01**	3.95	0.74	3.90	0.68
Student Motivation *Extent to which students are motivated to achieve and learn*	**4.16**	**0.79**	**4.40**	**<0.01**	4.08	0.75	4.20	0.34
School Suspension (%) *Proportion of students suspended from school*	**16.9**	**-**	**5.4**	**<0.01**	**25.7**	**-**	**6.7**	**<0.01**

[a] Attitude to school questions were completed by 120 students (year7:81; year 39); Suspension data were recorded for 106 participants (year 7: 71; year 9:35). Comparison data were sourced directly from government.

Bolding signifies a significant difference in attitudes at p<0.01.

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Table 4

Explanatory Variables for Student Attitudes to School

	Unadjusted *(n=99-120)*			**Model 1[a]** *(n=99)*			**Model 2[b]** *(n=99)*		
Explanatory Variables	**b[c] (95% CI)**	**p[d]**	**β[e]**	**b (95% CI)**	**p**	**β**	**b (95% CI)**	**p**	**β**
Child									
Age	-0.46 (-1.98, 1.06)	0.55	-0.05	-	-	-	-	-	-
Gender (male)	1.23 (-3.76, 6.20)	0.63	0.04	-	-	-	-	-	-
ADHD medication use (yes)	2.52 (-0.81, 5.85)	0.14	0.14	-	-	-	-	-	-
Pubertal stage (1 SD higher)	0.04 (-1.67, 1.74)	0.97	0.00	-	-	-	-	-	-
Academic functioning (1 SD higher)	**0.17 (0.06, 0.28)**	**<0.01**	**0.29**	0.46 (-1.64, 2.55)	0.67	0.05	0.02 (-2.11, 2.15)	0.98	0.00
IQ (1 SD higher)	**1.77 (0.16, 3.39)**	**0.03**	**0.20**	-0.13 (-2.06, 1.80)	0.89	-0.01	-0.11 (-2.06, 1.83)	0.91	-0.01
Inattentive symptoms (1 SD higher)	**-2.96 (-4.47, 1.46)**	**<0.001**	**-0.34**	-0.70 (-2.48, 1.09)	0.44	-0.08	-0.57 (-2.41, 1.49)	0.65	-0.06
Hyperactive symptoms (1 SD higher)	**-1.95 (-3.50, -0.41)**	**0.01**	**-0.22**	-0.72 (-2.56, 1.11)	0.44	-0.08	-0.43 (-2.35, 1.11)	0.44	-0.05
Conduct problems (1 SD higher)	**-1.99 (-3.61, -0.37)**	**0.02**	**-0.22**	-0.16 (-2.11, 1.79)	0.87	-0.02	0.32 (-1.67, 2.31)	0.75	0.03
Emotional problems (1 SD higher)	**-1.90 (-3.43, -0.37)**	**0.02**	**-0.22**	-1.34 (-3.00, 0.32)	0.11	-0.15	-1.55 (-3.22, 0.12)	0.07	-0.18
Self-regulation problems (1 SD higher)	**-2.28 (-3.79, -0.77)**	**<0.01**	**-0.27**	-1.23 (-0.69, 3.15)	0.21	0.14	1.07 (-0.85, 2.99)	0.27	0.12
Student depression (1 SD higher)	**-4.64 (-6.00, -3.28)**	**<0.001**	**-0.54**	**-3.65 (-5.52, -1.79)**	**<0.001**	**-0.42**	**-3.38 (-5.30, -1.48)**	**<0.01**	**-0.38**
Values education (yes)	**6.27 (3.23, 9.30)**	**<0.001**	**0.35**	**6.00 (2.96, 9.04)**	**<0.001**	**0.33**	**4.94 (1.72, 8.16)**	**<0.01**	**0.27**
Bullied (yes)	**-4.30 (-7.33, -1.27)**	**0.01**	**-0.25**	-2.04 (-5.25, 1.18)	0.21	-0.11	-1.81 (-5.04, 1.40)	0.27	-0.10
Parent and family									
Parent mental health (1 SD higher)	-0.91 (-2.61, 0.79)	0.29	-0.10	-	-	-	-	-	-
Family management (1 SD higher)	**-3.21 (-4.69, -1.74)**	**<0.001**	**-0.38**	**-**	**-**	**-**	**-2.14 (-3.67, 0.61)**	**<0.01**	**-0.25**
Socio-economic status (1 SD higher)	1.17 (-0.36, 2.69)	0.13	0.14	-	-	-	-	-	-
School environment				-	-	-	-	-	-
School sector (independent)	1.97 (-1.24, 5.19)	0.23	0.11	-	-	-	-	-	-
School location (provincial)	-1.39 (-4.89, 2.11)	0.43	-0.07						

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Model R^2	0.46	0.49
P value	**<0.001**	**<0.001**

[a]Adjusted for child variables significant at the univariate level excluding gender and pubertal status due to insufficient power; [b]Adjusted for child and family variables significant at the univariate level. [c]Regression coefficients (b) should be interpreted as a 1 SD unit change for continuous variable or difference between categories for categorical variables corresponding to change in ATS score., [d]P-values bolded are at p<0.1 for univariate results and p<0.05 for adjusted results. [e]Standardized coefficient provides an indication of the magnitude of the effect.

Table 5

Explanatory Variables Associated with Student Suspension

	***Univariate* (*n= 93 -106*)**		**Model 1[a] (*n= 93 -106*)**		**Model 2[b] (*n= 93 -106*)**	
Explanatory Variables	**OR (95% CI)**	***p*[c]**	**OR (95% CI)**	***p***	**OR (95% CI)**	***p***
Child						
Academic functioning (1 SD higher)	**0.50 (0.27, 0.93)**	**0.03**	**0.52 (0.28, 0.95)**	**0.03**	0.66 (0.35, 1.26)	0.21
IQ (1 SD higher)	**0.37 (0.19, 0.72)**	**<0.01**	**0.37 (0.18, 0 .73)**	**<0.01**	**0.46 (0.22, 0.95)**	**0.04**
Inattentive symptoms (1 SD higher)	0.91 (0.57, 1.47)	0.71	0.97 (0.58, 1.61)	0.91	1.08 (0.61, 1.94)	0.78
Hyperactive symptoms (1 SD higher)	**1.69 (1.01, 2.85)**	**0.05**	**1.96 (1.09, 3.53)**	**0.02**	**2.15 (1.10, 4.18)**	**0.03**
Conduct problems (1 SD higher)	**2.51 (1.48, 4.29)**	**<0.01**	**2.89 (1.58, 5.29)**	**<0.01**	**2.73 (1.45, 5.15)**	**<0.01**
Emotional problems (1 SD higher)	1.27 (0.77, 2.10)	0.34	1.63 (0.93, 2.84)	0.08	1.47 (0.81, 2.64)	0.21
Self-regulation problems (1 SD higher)	**1.61 (0.96, 2.73)**	**0.07**	1.71 (0.97, 3.03)	0.06	1.36 (0.73, 2.52)	0.34
Student depression (1 SD higher)	1.55 (0.92, 2.60)	0.10	1.65 (0.94, 2.87)	0.08	1.40 (0.76, 2.54)	0.28
Values education (yes)	1.02 (0.34, 3.01)	0.97	1.50 (0.45, 5.01)	0.50	2.28 (0.59, 8.86)	0.24
Bullied (yes)	0.97 (0.35, 2.72)	0.96	0.99 (0.33, 2.87)	0.98	1.02 (0.33, 3.14)	0.97
Parent and family						
Parent mental health (1 SD higher)	1.22 (0.75, 1.97)	0.42	1.24 (0.74, 2.02)	0.40	1.22 (0.71, 2.11)	0.47
Poor family management (1 SD higher)	**1.68 (1.04, 2.70)**	**0.03**	**1.66 (1.00, 2.79)**	**0.05**	1.40 (0.81, 2.43)	0.23
Socio-economic status (1 SD higher)	**0.60 (0.38, 0.93)**	**0.02**	**0.51 (0.31, 0.83)**	**<0.01**	-	**-**
School environment						

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School sector (independent)	**0.21 (0.06, 0.76)**	**0.02**	**0.18 (0.05, 0.72)**	**0.02**	**0.21 (0.04, 0.85)**	**0.03**
School location (provincial)	**3.50 (1.25, 9.79)**	**0.02**	**3.96 (1.30, 12.03)**	**0.02**	3.08 (0.97, 9.79)	0.06

[a]Adjusted for child age, gender and medication use. [b]Adjusted for child age, gender, medication use and SES (SEIFA). [c]p-values bolded are at $p<0.1$ for univariate results and $p<0.05$ for adjusted results

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