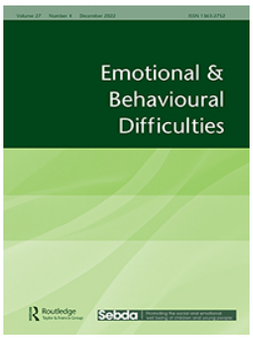

Emotional and Behavioural Difficulties

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rebd20

ADHD symptoms and maladaptive achievement strategies: the reciprocal prediction of academic performance beyond the transition to middle school

Palmu Iines R., Määttä Sami J., Närhi Vesa M. & Savolainen Hannu K.

To cite this article: Palmu Iines R., Määttä Sami J., Närhi Vesa M. & Savolainen Hannu K. (2023): ADHD symptoms and maladaptive achievement strategies: the reciprocal prediction of academic performance beyond the transition to middle school, Emotional and Behavioural Difficulties, DOI: 10.1080/13632752.2023.2189404

To link to this article: https://doi.org/10.1080/13632752.2023.2189404

Published online: 15 Mar 2023.

EMOTIONAL AND BEHAVIOURAL DIFFICULTIES
https://doi.org/10.1080/13632752.2023.2189404

ADHD symptoms and maladaptive achievement strategies: the reciprocal prediction of academic performance beyond the transition to middle school

Palmu Iines R.[a,b], Määttä Sami J.[c], Närhi Vesa M.[a] and Savolainen Hannu K.[d]

[a]Department of Education, University of Jyväskylä, Jyvaskyla, Finland; [b]Valteri National Centre for Learning and Support, Finland; [c]Department of Psychology, Tampere University, Finland; [d]School of Education and Psychology, University of Eastern Finland, Finland

ABSTRACT

This longitudinal study examined how two externalising behaviour problems, attention-deficit hyperactivity disorder (ADHD) and conduct disorder (CDs), are associated over time with low motivation (MAS), and how these problems effect academic performance. In our cross-lagged analysis, we found reciprocal effects between ADHD symptoms and MAS between Grades 5 and 6. Both domains also negatively predicted later academic performance. With CDs and MAS, no cross-lagged effects were found, although both were correlated and very stable over time, and negatively predicted later academic performance. These different kinds of externalising problem behaviours seem to differ in the way in which they interact with students' MAS and academic performance in the long term. Students with ADHD symptoms are likely to be more vulnerable to negative learning experiences and the development of MAS than students with CDs.

Highlights

- ADHD and MAS had a reciprocal over-time association, and both negatively predicted academic performance beyond school transition.
- CDs and MAS had a strong within-time association and they separately predicted academic performance beyond school transition.
- Students with ADHD symptoms seem to be more vulnerable to the negative effects of MAS than students with CDs.

KEYWORDS

ADHD; conduct disorders; maladaptive achievement strategies; academic performance

Introduction

Externalising behaviour problems are negatively associated with academic outcomes in both the short and long term and often have negative effects on multiple aspects of life (Fergusson, Horwood, and Ridder 2007; Frazier et al. 2007; Reid et al. 2004). In addition, the maladaptive achievement strategies (MAS), which students deploy can have negative short- and long-term effects on both academic performance and overall academic achievement (Midgley and Urdan 1995; Midgley, Arunkumar, and Urdan 1996; Nurmi et al. 2003). These strategies are often associated with externalising behaviour problems (see, e.g. Aunola, Stattin, and Nurmi 2000). However, little is known about how MAS are related specifically to the different dimensions of externalising behaviour problems – that is, the symptoms of ADHD (inattention, hyperactivity and impulsivity) and conduct disorders

CONTACT Iines R. Palmu iines.palmu@valteri.fi Department of Education, University of Jyväskylä, Jyvaskyla, Finland

(CDs: oppositional, aggressive, antisocial)—and how the different symptom dimensions together with MAS contribute to academic performance.

There is strong evidence indicating that in relation to academic performance, the symptoms of ADHD and CDs should be studied separately (Hinshaw 1992). The negative associations between ADHD and academic performance are well established (Loe and Feldman 2007). However, for CDs, the association with academic performance is not as clear (Reid et al. 2004). In addition, the symptoms of ADHD and CDs seem to interact differently with academic performance over the transition from primary to middle school (Palmu, Närhi, and Savolainen 2018).

The vast majority of the achievement strategy literature focuses on adolescents (see, e.g. Aunola, Stattin, and Nurmi 2000; Määttä, Nurmi, and Stattin 2006), young adults (Kusurkar et al. 2013), or on young children (Gut et al. 2012; Metsäpelto et al. 2015), while middle childhood and early adolescence have remained understudied. This is an important stage for development, as the transition from primary to middle school entails a significant change of environment and increasing academic demands (Pietarinen, Pyhältö, and Soini 2010). Moreover, the evidence that considers symptoms of ADHD and CD and academic outcomes is largely based on clinical or high-risk samples from disadvantaged populations (e.g. Gut et al. 2012), and the achievement strategies are often evaluated by teachers or guardians instead of the students themselves (e.g. Olivier and Steenkamp 2004). Consequently, the present study addresses the need to examine separately teacher-evaluated symptoms of ADHD and CDs and how they interact with students' self-evaluated MAS and predict later academic performance after students' transition from primary to middle schools in a community sample.

ADHD, CDs, and academic performance

The core symptoms of ADHD are developmentally inappropriate levels of hyperactivity, impulsivity, and/or inattention (American Psychiatric Association 2013: DSM-V). ADHD is a highly heritable, childhood-onset, multifactorial, neurodevelopmental disorder generated by a combination of genetic, biological, and psychosocial factors (Nigg, Nikolas, and Burt 2010; Thapar and Cooper 2016). It is highly comorbid with other externalising and internalising problems (American Psychiatric Association 2013 DSM-V; Thapar and Cooper 2016) and learning disorders (DuPaul, Gormley, and Laracy 2013), all of which can hinder learning. ADHD diagnoses are more common among boys (Ramtekkar et al. 2010), and the diagnoses are also associated with low parental education level (Torvik et al. 2020).

The prevalence rates of learning and/or achievement problems at school in samples of youth with ADHD range from 50% to 80%, and academic problems persist into adolescence and adulthood in most cases (DuPaul and Langberg 2015). Both students with formally diagnosed ADHD and those with ADHD symptoms are likely to perform below their levels of ability (Diamantopoulou et al. 2007; Rodriguez et al. 2007), have poor educational outcomes (Arnold et al. 2015; Frazier et al. 2007; Loe and Feldman 2007), and higher rates school dropout in comparison to their peers (Fried et al. 2016). The negative effects that ADHD symptoms have on academic performance remain after controlling for intelligence, comorbidity, and socioeconomic status (Polderman et al. 2010).

These students' academic impairment is primarily related to the core symptoms of inattention and to the cognitive deficits in executive functions (working memory, inhibition, and mental-set shifting) (EFs; Langberg et al. 2013; White, Jarrett, and Ollendick 2013). Success in learning situations requires skills to regulate learning and manage social interaction, both of which can be difficult for students with ADHD symptoms. Difficulties initiating, staying focused on, organising, or finishing tasks hamper learning and academic performance, creating frequent experiences of failure, which are related to development of MAS (Nurmi 2015).

Hyperactivity and impulsivity tend to decrease with age (Polanczyk et al. 2014), school transition, an important environmental change, is associated with a disruption in the developmental decline of these symptoms (Langberg et al. 2008). The transition to middle school includes changes in both the

academic and social environment, bringing forth new demands regarding independence, skills, and adjustment (Pietarinen, Pyhältö, and Soini 2010).

CDs are characterised by persistent oppositional, aggressive, and antisocial behaviour patterns (American Psychiatric Association 2013; DSM-V) and typically emerge during either childhood or adolescence and are more common among males than females (Maughan et al. 2004). The core symptoms include breaking common rules, lying, being physically or verbally aggressive, bullying or damaging other peoples' property on purpose (American Psychiatric Association 2013; DSM-V), which can lead to various social difficulties at school (Erskine et al. 2016). They are often comorbid with internalising problems (McDonough-Caplan, Klein, and Beauchaine 2018) and may co-occur with learning disabilities and verbal deficits (Lynam and Henry 2001; Närhi et al. 2010; Teichner and Golden 2000), which by themselves are a risk for failure at school. Youth with CDs have a higher risk of school dropout than their peers (Arnold 1997), and show higher levels of academic failure and disengagement with school (Elias and Haynes 2008).

In conclusion, students with ADHD symptoms have increased risk of motivational problems (Smith and Langberg 2018) and school failure due to the cognitive, social, and behavioural difficulties experienced alongside the symptoms (Birchwood and Daley 2012; Gut et al. 2012; Olivier and Steenkamp 2004). Students with CDs may have some cognitive and, most importantly, social, and behavioural difficulties that are a risk for developing low academic performance and motivation, especially in adolescence (Crum, Waschbusch, and Willoughby 2016; Erskine et al. 2016).

MAS and academic performance

One aspect of achievement motivation can be conceptualised as achievement strategies. Achievement strategies refer to a person's typical tendency to deal with challenging and demanding situations and are usually classified as adaptive or maladaptive. MAS are also often called task-avoidant strategies (Onatsu-Arvilommi and Nurmi 2000), and typically include fears of failure and avoidant behaviour in challenging situations. They have been described in the literature using multiple concepts (e.g. self-handicapping: Jones and Berglas 1978; learned helplessness: Dweck and Leggett 1988; task-avoidant behaviour: Nurmi 1993; Zhang et al. 2011 performance avoidance: Elliot and Hulleman 2017). All these concepts are related to a negative cyclical process that consists of *failure-oriented cognition (e.g. low beliefs in personal control)*, *negative affects (e.g. fear of failure)*, and *harmful behavioural strategies (e.g. task avoidant behaviour)* that students experience in challenging learning situations (Elliot and Harackiewicz 1996; Nurmi 1993).

The development of MAS is a process whereby previous experiences and concepts of the self in certain kinds of situations direct how one anticipates one's ability to perform in similar situations, creating a risk for a negative cycle (Nurmi 2015). Failures in school tasks with the associated direct and indirect negative feedback can create a negative academic self-concept of ability and low efficacy beliefs. This may lead to low effort and task-avoiding behaviours in academic settings (Nurmi 2015; Onatsu-Arvilommi and Nurmi 2000), which often make failure more likely, thereby creating new experiences of failure (Aunola et al. 2002). The student then strives to avoid the negative emotions in challenging situations by avoiding the task at hand. In the moment, MAS may provide the student with a way out, but they tend to lead to poor academic performance and subsequent experiences of failure (Midgley and Urdan 1995; Zuckerman, Kieffer, and Knee 1998). In the long term, the deployed strategies are reflected in students' school adjustment (Nurmi, Salmela-Aro, and Ruotsalainen 1994) overall adjustment (Midgley, Arunkumar, and Urdan 1996; Roeser, Eccles, and Strobel 1998) and academic achievement (Midgley and Urdan 1995).

A substantial amount of research has been carried out on the association between students' achievement strategies and their academic performance (e.g. Carr, Borkowski, and Maxwell 1991; Nurmi, Onatsu, and Haavisto 1995). MAS have been found to predict subsequent poor academic performance among both young children (Aunola et al. 2002; Mägi, Häidkind, and Kikas 2010) and adolescents (Midgley and Urdan 1995), especially in terms of task avoidance. In addition, among

younger children with learning difficulties, slow academic progress and low levels of literacy skills seem to predict an increase in task avoidance (Aunola et al. 2002; Onatsu-Arvilommi and Nurmi 2000; Pakarinen et al. 2011). Also, some reciprocal effects (Aunola et al. 2002; Metsäpelto et al. 2015) and cumulative cycles of low academic performance and task avoidance have been reported (Metsäpelto et al. 2015; Onatsu-Arvilommi and Nurmi 2000). However, previous research has focused mainly on task-avoidant behaviour (Midgley and Urdan 1995; Nurmi 1993), but not wider aspects of MAS.

ADHD, CDs, and MAS

Students with ADHD have shown to have more motivational problems in relation to school than their peers (Smith and Langberg 2018) and it has been suggested that they, similarly to MAS, also strive to avoid failure, rather than to obtain success and engage in tasks (Olivier and Steenkamp 2004). Students with ADHD show low competence beliefs (Barron et al. 2006; Zentall and Beike 2012), low achievement motivation and task persistence (Gut et al. 2012), active avoidance of tasks requiring sustained self-regulation (Barron et al. 2006; Carlson et al. 2002; Olivier and Steenkamp 2004), and frustration during tasks requiring focused attention (Martínez et al., 2016). These mostly teacher or parent-reported motivational features resemble the observable core symptoms of ADHD. Consequently, the distinction between these symptoms and MAS can be rather difficult from the outside. Part of these reported motivational difficulties may be manifestation of core symptoms of ADHD; however, some of the observations are just as likely related to negative learning experiences. Every student showing MAS does not necessarily have ADHD symptoms, and vice versa. For example, Gut et al. (2012) found that students with diagnosed ADHD who showed a high will to succeed and engage with tasks did as well as their typical student comparisons in tasks requiring language skills and mathematical thinking.

There is very little research about CD's and MAS. Gut et al. (2012) found no differences in achievement motivation between students with disruptive behaviours and the reference group. Yet, there are factors related to CD's which may lead to the development of MAS, such as problem behaviour at school or cognitive deficits (i.e. learning disabilities and verbal deficits) (Aunola, Stattin, and Nurmi 2000; Nurmi, Salmela-Aro, and Ruotsalainen 1994). School may feel unrewarding, and students' self-esteem may decrease (e.g. Zimmermann et al. 2013). In addition, poor student–teacher relationships can strengthen the development of MAS, as they can negatively affect both behaviour and academic achievement (Zee, de Jong, and Koomen 2017). It is possible that problem behaviours and academic failures together create a reciprocal cycle in which each problem exacerbates the other, and the effects may extend to achievement strategies.

Much of the achievement strategy literature focuses on skill-specific areas, such as reading, writing, and mathematics (Lee and Zentall 2012; Zentall and Beike 2012), instead of overall academic performance and rarely entails the differentiation of ADHD and CD symptoms. Metsäpelto et al. (2015) found that during the early primary school years, the negative association between externalising problems (including both ADHD and CD symptoms) and academic performance was partly mediated via task-avoidant behaviour. Gut et al. (2012) studied language skills, mathematical thinking, and achievement motivation in 6–10-year-old children with diagnosed ADHD, CDs, and normal controls. They found that achievement motivation was a key factor in the development of receptive language and mathematical thinking in children with ADHD but not in children with CDs. This suggests that achievement motivation should be investigated separately with ADHD and CD symptoms.

The authors (Palmu, Närhi, and Savolainen 2018) studied the over-time association between externalising behaviour problems and academic performance from Grade 6 to Grade 7. When child- and family-related covariates were controlled, previous ADHD symptoms systematically had a negative effect on Grade 7 academic performance, whereas the results for CD models were inconsistent. As we know, the symptoms of ADHD and CDs are quite stable over time. MAS, especially avoidance of learning tasks, are quite stable, more common among boys and have

a negative impact on academic performance (Midgley and Urdan 1995; Onatsu-Arvilommi and Nurmi 2000). What remains to be examined is a) how the symptoms of ADHD and CDs are associated with MAS during late primary years and school transition and b) what common effects the symptoms of ADHD, CDs, and MAS have on academic performance. Our research questions were as follows:

(1) Do the symptoms of ADHD or CDs have cross-lagged associations with MAS? If they do, what are the direction and strength of these associations?
(2) How do the symptoms of ADHD or CDs together with MAS predict later academic performance?

Method

Participants

The data used in this study was collected as a part of a large longitudinal study that took place in Eastern Finland between 2010 and 2013. A cohort of pupils, their teachers and parents were given a questionnaire while pupils were in 5th, 6th, and 7th grade. Six 5th grade students per class (11-year-olds, 52% female) were randomly drawn for teacher ratings of externalising behaviour problems and followed until the end of 7th grade. While the number of data varied between measurement points and individual variables (see Table 1), full information maximum likelihood estimation in the SEM-models used data from 311 participants.

Measures

The symptoms of ADHD and CDs were assessed by classroom teacher using the Finnish version of the Strengths and Difficulties Questionnaire (Goodman 1997). Hyperactivity/inattention scale has five items (e.g. *'Restless, overactive, cannot stay still for long'* and *'Easily distracted, concentration wanders'*) as does the conduct problems scale (e.g. *'Often fights with other youth or bullies them'* and, *'Often lies or cheats'*). Items were rated on a 3-point scale (1 = not true, 2 = somewhat true, and 3 = certainly true). The SDQ is widely used to screen the behaviour of children and adolescents between 4 and 16 years of age and has been shown to be a valid screening instrument (Goodman et al. 2000) also in Finland (Koskelainen 2008). SDQ data from 5th and 6th grade was used in this study as the mean score of each symptom and the Cronbach's alpha reliabilities were .75 and .87 for hyperactivity/inattention symptoms and .77 and .63 for CD symptoms (Grades 5 and 6, respectively).

MAS were assessed with the Strategy and Attribution Questionnaire for Children (SAQ-C; Aunola, Onatsu-Arvilommi, and Nurmi 1999; Nurmi et al., 1995). Mean score of nine items measuring maladaptive strategies (e.g. *'When we are doing exercises at school, I'm afraid I can't do them,' 'If*

Table 1. Descriptive statistics of observed variables.

Variable	*n*	*M*	*SD*	*Skew (SE)*	*Kurt. (SE)*	*Min.*	*Max.*
1. T1 Conduct problem symptoms	281	1.19	.31	2.15 (.15)	5.06 (.29)	1.00	2.80
2. T2 Conduct problem symptoms	311	1.22	.29	1.50 (.14)	1.87 (.28)	1.00	2.33
3. T1 ADHD symptoms	281	1.50	.46	1.13 (.15)	1.03 (.29)	1.00	3.00
4. T2 ADHD symptoms	311	1.51	.53	1.06 (.14)	.27 (.28)	1.00	3.00
5. T1 Maladaptive achievement strategies	262	2.37	.74	.47 (.15)	−.08 (.30)	1.00	4.93
6. T2 Maladaptive achievement strategies	289	2.41	.77	.18 (.14)	−.36(.29)	1.00	5.00
7. T3 Grade Point Average	251	7.88	1.11	−.26 (.15)	−.74 (.30)	5.00	10.00
8. Parental education level	224	4	1.72	.54 (.16)	−.45 (.32)	1.00	8.00
9. Reading comprehension	272	30.60	6.88	−.21 (.15)	−.21 (.29)	9.00	47.00
10. Basic mathematics test	279	38.53	7.02	−.13 (.15)	.33 (.29)	12.00	56.00
11. Gender (1=girl 2=boy)	311	1.48	.50	.08 (.14)	−2.01 (.28)	1.00	2.00
12. T1 Grade Point Average	245	8.22	.88	−.43 (.16)	−.31 (.31)	5.33	10.00

T1 = Grade 5, T2 = Grade 6, T3 = Grade 7, *M* = mean, SD = standard deviation, Skew = skewness statistics, Kurt. = kurtosis statistics, Min. = minimum value, and Max. = maximum value.

something is difficult at school, I gladly do something else,' and *'If something goes wrong at school, I think teachers and other students consider me stupid'*) was used. The pupils rated statements on a 4-point scale (1 = strongly agree to 4 = strongly disagree). The Cronbach's alpha reliabilities were .76 (Grade 5) and .79 (Grade 6).

Academic performance was assessed using individual student grades given by the teachers each year (Grade 5 $N = 245$ Grade 7 $N = 251$). In Finnish comprehensive schools grading ranges from 4 (F, fail), to 10 (A, excellent). In grade 5 performance grades in reading, language arts, and mathematics were received from teachers and in Grade 7 corresponding grades were drawn from school registers.

Basic academic skills were measured by academic achievement test on reading comprehension (Lindeman 1998) and basic mathematic skills (Räsänen 2004). *Reading comprehension* was measured using a subtest of a widely used standardised test battery where students answered 12 multiple-choice questions based on a two-page silently read text within a 60-min time frame. The text was available while the students answered the questions. This test has been shown to have acceptable validity and reliability (Cronbach's alpha .64 and Revelle's omega .86; Lindeman 1998). *Basic mathematics skills* were assessed with a standardised test (RMAT: Räsänen 2004) that is a time-restricted test consisting of 56 items (basic addition, multi-digit calculations, fractions, decimals, measurement, and algebra tasks). The total score is the number of items answered correctly in 10 min. The test has been shown to have high internal validity and reliability in Finland: the Cronbach's alpha reliability for the test was .92–.95 between the ages of 9 to 12 (Räsänen 2004).

Students' mothers' level of education (later: parent educational level: PED) was measured using an 8-point scale ranging from comprehensive education only to master's/doctoral education level. Only 2.4% of mothers had no education beyond the comprehensive level (i.e. no vocational degree), and 33.7% had higher vocational diplomas, bachelor's, master's, or doctoral degrees. The overall distribution of mothers' education level was comparable to that of the general population at the time of the study (Official Statistics Finland 2013).

Analyses

The analyses strategy was to use cross-lagged models to test the directions of association between study variables. Two cross-lagged path models were estimated: one for the symptoms of ADHD and MAS and another for CDs and MAS. In these models, both stability and cross-lagged paths between externalising behaviours and MAS were estimated. Simultaneously measured constructs in the models were allowed to correlate. The models were set to predict Grade 7 academic performance and covariates were included to the models. The analyses were performed with Mplus statistical package (Version 7) using the maximum likelihood robust (MLR) estimation (Muthén and Muthén 1998–2013) as the distributions of the variables used were not completely normal.

In this study sample, the proportion of nonresponses in the different variables ranged from 1% to 35% (M = 17.42%). The rate of attrition in all variables of a particular wave was relatively small and the missingness was tested to be completely at random (Little's MCAR $p = .197$). Additionally, Mplus uses the full-information maximum likelihood estimation (FIML) which used all available data and is an effective approach to handle missing data (Enders 2010). Model fit was evaluated with five indicators: X^2/df, root-mean-square error of approximation (RMSEA), Bentler's comparative fit index (CFI), Tucker-Lewis index (TLI), and standardised root-mean-square (SRMR).

Results

The descriptive statistics and correlations of the observed variables are shown in Tables 1 and 2. The correlations of study variables across grades indicated moderate to high inter-individual stability.

Table 2. Sample correlation matrix.

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. T1 CD	–											
2. T2 CD	.62**	–										
3. T1 ADHD	.70**	.57**	–									
4. T2 ADHD	.66**	.71**	.76**	–								
5. T1 MAS	.24**	.20**	.24**	.30**	–							
6. T2 MAS	.19**	.33**	.24**	.32**	.62**	–						
7. T3 GPA	−.30**	−.40**	−.41**	−.55**	−.31**	−.44**	–					
8. T1 GPA	−.37**	−.43**	−.50**	−.60**	−.38**	−.43**	.77**	–				
9. PED	−.12	−.10	−.06	−.11	−.16*	−.04	.24**	.26**	–			
10. RC	−.19**	−.16**	−.29**	−.29**	−.32**	−.33**	.58**	.64**	.31**	–		
11. MATHS	−.13*	−.18**	−.22**	−.28**	−.24**	−.24**	−.50**	−.52**	.12	.41**	–	
12. GENDER	.28**	.26**	.36**	.38**	.01	.05	−.27**	−.29**	.10	−.14*	−.14*	–

T1 = Grade 5, T2 = Grade 6, T3 = Grade 7, CD = conduct disorders symptoms, ADHD = hyperactivity/inattention symptoms, MAS = maladaptive achievement strategies, GPA = Grade Point Average, PED = parental education level, RC = reading comprehension *p < .05, **p < .01.

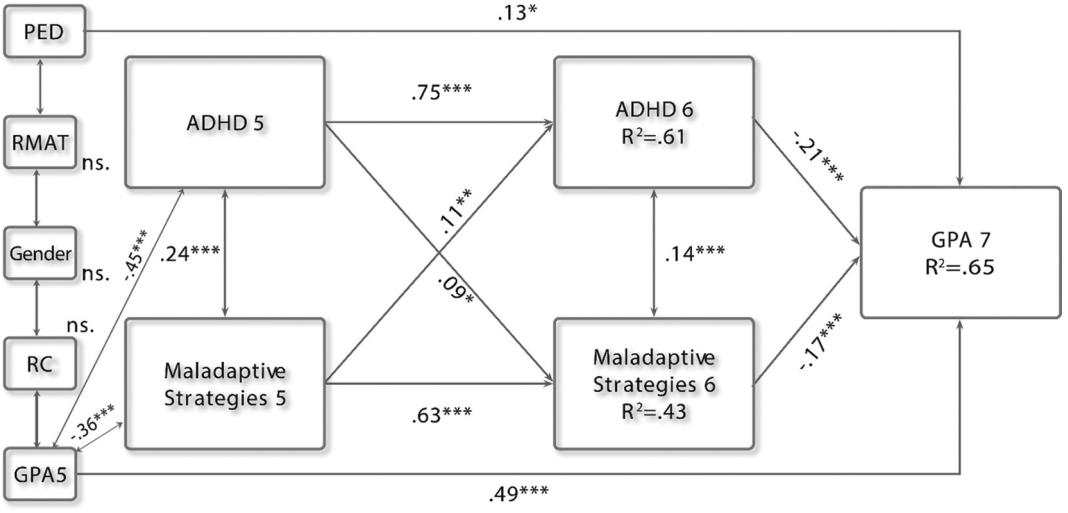

Figure 1. ADHD symptom model with covariates – standardised coefficients. PA = Grade Point Average, ADHD = hyperactivity/inattention symptoms, PED = parental education level, RC = reading comprehension, RMAT = standardised math test score. *p < .05 *** p < .001.

The dynamics between ADHD symptoms, MAS, and academic performance

The ADHD symptom model (Figure 1, $n = 311$, $\chi^2 = 23.55$, df = 12, $p = 0.02$, RMSEA = 0.06, CFI = 0.98, TLI = 0.96, and SRMR = 0.03) showed reciprocal cross-lagged associations. Grade 5 MAS predicted Grade 6 ADHD symptoms and Grade 5 ADHD symptoms predicted Grade 6 MAS. Of the covariates, only PED and Grade 5 academic performance predicted the academic performance of Grade 7. Grade 5 GPA was strongly associated with Grade 5 ADHD symptoms and MAS. In addition, Grade 5 GPA correlated with gender (−.24***), i.e. being a boy. The indirect effects were tested with the Model Indirect command in Mplus. A significant indirect effect (−.02*) from Grade 5 MAS via ADHD 6 to GPA 7 was found. In addition, both Grade 5 ADHD symptoms (−.16***) and MAS (−.11***) indirectly affected Grade 7 GPA via the same Grade 6 measures.

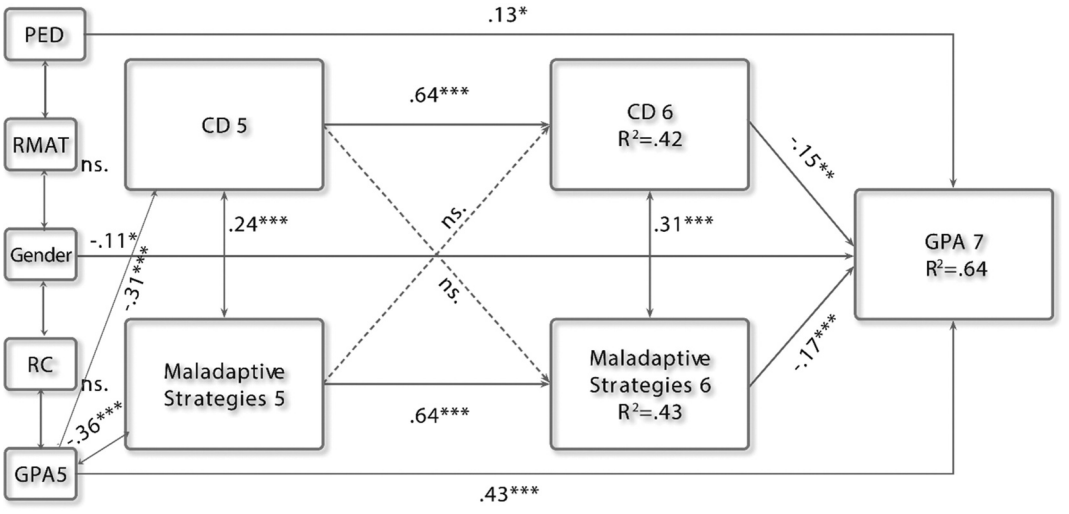

Figure 2. CD symptom model with covariates – standardised coefficients. GPA = Grade Point Average, ADHD = hyperactivity/inattention symptoms, PED = parental education level, RC = reading comprehension, RMAT = standardised math test score. *$p < .05$ **$p < .01$., *** $p < .001$.

The dynamics between CD symptoms, MAS, and academic performance

The CD symptom model (Figure 2, $n = 311$, $\chi^2 = 16.40$, df = 12, $p = 0.17$, RMSEA = 0.03, CFI = 0.99, TLI = 0.98, and SRMR = 0.03) showed no cross-lagged associations after the covariates were added to the baseline model. CDs and MAS correlated at both time points. Grade 5 GPA was associated with Grade 5 CD symptoms and MAS. In addition, Grade 5 GPA correlated with gender (–.31***). PED, gender, and previous academic performance predicted Grade 7 academic performance. In addition, Grade 5 CD symptoms (–.10**) and MAS (–.11***) both indirectly affected Grade 7 GPA via the same Grade 6 measures.

Discussion

In this study, we utilised a cross-lagged design to investigate the associations between students' teacher-rated ADHD and CD symptoms, self-reported MAS, and how these constructs predict academic performance beyond the transition from primary to middle school. The symptoms of ADHD and CDs were studied separately and differing associations with MAS were found. Over the one-year time gap teacher-rated ADHD symptoms seemed to increase student's self-reported MAS, and MAS on the other hand, increased ADHD symptoms the next school year. Both also had a negative effect on Grade 7 GPA over the transition to middle school. With CD's, such cross-lagged paths were not found. CDs and MAS were correlated at both time points and Grade 6 measures both had negative effect on Grade 7 GPA.

The high stability of ADHD symptoms and MAS were in line with the findings of previous studies (Gut et al. 2012; Palmu, Närhi, and Savolainen 2018). All grade 6 measures (ADHD, CD and MAS) negatively predicted Grade 7 academic performance, which was expected in the light of existing literature (Palmu, Närhi, and Savolainen 2018; Metsäpelto et al. 2015). Also, an indirect effect from Grade 5 MAS via Grade 6 ADHD symptoms to grade 7 GPA was found. The negative effects of Grade 6 MAS and CD symptoms on later academic performance were almost equivalent. In both models, parental education level and previous academic performance predicted Grade 7 GPA in addition to externalising behaviour symptoms. Although gender had a significant negative effect in GPA in the CD model but not in the ADHD model, the practical effect size was similar in both models. In contrast

to previous literature (Maughan et al. 2004), PED was not associated with students' ADHD symptoms (Torvik et al. 2020).

There are at least two mechanisms that may explain the reciprocal effects between ADHD symptoms and MAS. First, the symptoms of inattention and ADHD-related deficits in executive functions (Langberg et al. 2013; White, Jarrett, and Ollendick 2013) are likely to make it difficult for students to manage schools' everyday demands, which may generate MAS in challenging situations. Students experiencing ADHD symptoms are also likely to have increased negative interactions and feedback with teachers (Rogers et al. 2015), which may, in turn, generate low competence beliefs; failure expectations; and, finally, a low tendency to exert the effort needed for success in academic work (Nurmi et al. 2003). Second, as academic demands increase when moving to higher grades (i.e. from 5^{th} to 6^{th}), MAS may increasingly influence a student's behaviour in learning situations. Specifically, ADHD-symptoms may become more prominent in everyday learning situations as learning processes become more frustrating, partially as a result of MAS use. The data suggests that over time these negative patterns both hinder learning and strengthen each other, creating a negative cycle, together taxing academic performance even after transition to middle school. For example, Zentall and Beike (2012) found that from Grade 3, students with ADHD symptoms started to utilise MAS more than their peers. It is likely that by Grade 5, these students have experienced a significant amount of failure and negative feedback at school, resulting a negative academic self-concept, as both correlations of MAS, ADHD symptoms and GPA on grade 5, and the reciprocal effects observed indicate.

From practical point of view, the lack of this kind of negative cycle in the CD model seems rather understandable. Similar reciprocal interactions do not exist between CDs and MAS, as the CDs do not affect learning situations and learning as directly as ADHD symptoms. CDs are more reflected in social interactions with peers and adults (Crum, Waschbusch, and Willoughby 2016; Erskine et al. 2016), which may also explain the correlations of MAS and CDs. From Grade 5 to 6 the academic demands and social structure of the classroom remain quite stable, which may indicate that this age is not relevant to the reciprocal development of CDs and MAS: both have already grown to be quite stable and are associated within time, but they no longer influence each other's level. Thus, MAS do not increase CD symptoms or vice versa, but these challenges develop side by side. The correlations between MAS and CDs may be at least partly due to social interaction, especially teacher – student relationships (Murray and Murray 2004; Spilt and Koomen 2009; Zee, de Jong, and Koomen 2017). Students with CDs are known to have increased negative feedback and conflictual interactions with teachers and peers (Murray and Murray 2004), which can also be reflected in their grades (Spilt and Koomen 2009). It is likely that negative experiences in learning situations and classroom interactions accumulate (the indirect effects), leading to low competence beliefs, general negative feelings towards school, and low interest and effort in learning situations (Nurmi 2015).

Previous studies have indicated that among younger students, a high quality of instructional support by teachers lowers the level of students' MAS (Pakarinen et al. 2011). This combined with our results indicates that early detection of students with ADHD symptoms and helping them learn more adaptive achievement strategies through targeted motivational intervention is important. Providing adequate learning support and feedback is especially important to decrease the development of MAS in students with ADHD symptoms. MAS should be further investigated especially among children with ADHD symptoms for at least two reasons: first, learning more adaptive strategies and ways of learning can reduce the effect ADHD symptoms have on learning, and finding new ways to learn may itself improve academic performance.

The negative cycle of ADHD symptoms and MAS has negative effects on academic performance even after the school transition. MAS are generated by experiences of failure, having ADHD symptoms increases the risk of MAS and the symptoms can also be mistaken for MAS. To detect the students at risk early screening for ADHD symptoms as well as MAS is important. It is not always clear from the outside, which one is hampering learning. These students need adequate pedagogical support for especially inattention symptoms and

targeted support in learning more adaptive achievement strategies to succeed in self-regulation and goal-oriented behaviour. Support combined with realistic informative feedback would likely decrease experienced failures, improve motivation and thus successful self-regulation in school (Nurmi 2015).

To interrupt the strengthening of the negative cycle of (ADHD – MAS – decreasing academic performance), interventions should entail both support for executive functions (e.g. structured teaching and materials, support for inhibition, and working memory; Hofmann, Schmeichel, and Baddeley 2012) and targeted teaching of more adaptive achievement strategies as a process (Nurmi 2015). These students need to learn that earlier failures do not necessarily lead to new experiences of failure when the process is interrupted. One more thing to consider is the contextuality in the strength of ADHD symptoms (Imeraj et al. 2013) – the provided support needs to be well structured and accessible in an optimal (social) environment. More adaptive strategies help the students have more positive attitudes towards learning situations, and thus, to better to orientate to task at hand, which helps them to succeed better.

The teaching of more adaptive, task-oriented strategies includes making one's typical ways of thinking and (re)acting more conscious (Aunola, Stattin, and Nurmi 2000; Nurmi 2015), as achievement strategies are activated when the challenging situation rises. The process starts with overall academic self-concept, which creates the basis of how one expects to cope (i.e. failure expectations; Nurmi 2015). For this, the early recognition and acknowledgement of previous negative experiences and the effects of ADHD symptoms and MAS behind them is important. These students need support for understanding the challenges (for example: working memory, inhibition, emotion regulation, mental-set shifting), outlining the steps to take to complete the task (for example: planning, organisation, initiating, self-monitoring), support in anticipating positive outcomes (i.e. more task-oriented behaviour), positive and realistic feedback (with information of the steps leading to success), new encouraging causal attributions (feedback, self-monitoring) and anticipation strategies and action plans for dealing with expectations (for example: emotion regulation: Nurmi 2015).

The dynamics between ADHD or CDs and MAS are likely to include additional components – for example, the quality of instruction, nature of the learning environment, and relationship between students and teachers (Murray and Murray 2004; Rogers et al. 2015; Spilt and Koomen 2009). These developmental dynamics should be examined in greater detail, especially on earlier stages of school path and in relation to school transition. The field could also benefit from boarder theoretical frameworks in conceptualisation and operationalisation of motivation in relation to ADHD symptoms. All in all, the findings suggest that more attention needs to be paid to the negative cycle of ADHD symptoms and MAS; these two are strengthening risks for each other, and the negative cycle can only be interrupted in learning situations.

There are some limitations to this study. The data set is rather small and from about ten years ago. Another possible limitation is that the cross-lagged investigations record development only at a group level, while person-oriented approach might provide more detailed information about the phenomena. In addition, as a screener the SDQ only entails the subset of ADHD and CD symptoms. Although we considered multiple important covariates, the causal conclusions should be made with caution. There might be multiple other factors effecting over-time associations. A deeper understanding of the interactions between MAS, ADHD and CDs during school transition is needed.

Both behaviour problems and MAS experienced in primary school extend their effects beyond school transition. Our results indicate that especially ADHD symptoms and MAS together can have significant longitudinal effects on academic performance from primary to middle school. Students with ADHD symptoms are more vulnerable to facing negative learning experiences and developing MAS than students with CDs. The strength of the study lies in its prospective longitudinal design including school transition, as well as the multiple assessments and informants over time, which enabled testing of the cross-lagged associations. Future research should further examine the stability

of the MAS and reciprocal effects of MAS and ADHD earlier on school path. In addition, the role, and different aspects of school transition in the development of MAS should be further examined.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by a personal PhD-grant by the Finnish Cultural Foundation, Grant number 05162102. The data was gathered in project funded by thy Finnish National Board of Education (FNBE) grant code 219/509/2009, 146/509/2010

Notes on contributors

Iines Palmu (MEd) is a PhD candidate at the University of Jyväskylä and development coordinator the Valteri National Centre for Learning and Consulting. Her major research interests are externalizing behaviour problems, motivation and school attendance problems in early adolescence, and teachers' professional development.

Sami Määttä (PhD, psychology) works as a University Lecturer of Personality Psychology at Tampere Universities, Finland. His research interests are learning motivation, educational attainment and obstacles to learning in adolescence and emerging adulthood.

Vesa Närhi (PhD, Psychology) is a senior researcher in special education at the University of Jyväskylä. His interests are learning disabilities in general, and especially school-based interventions to support attention and behavior.

Hannu Savolainen (PhD, education) is a professor in special education in the School of Educational Sciences and Psychology at the University of Eastern Finland, and an extraordinary professor in the Optentia research unit in North-West University, South Africa. His major research interests are school wide positive behaviour supports interventions and international comparative education research especially on teachers' attitudes and their self-efficacy in implementing inclusive education.

ORCID

Palmu Iines R. http://orcid.org/0000-0002-6599-8743
Määttä Sami J. http://orcid.org/0000-0002-2347-8395
Närhi Vesa M. http://orcid.org/0000-0002-2619-8364
Savolainen Hannu K. http://orcid.org/0000-0002-1264-3746

References

American Psychiatric Association. 2013. *Diagnostic and Statistical Manual of Mental Disorders*. 5th. DSM-5. Arlington, V.A. https://www.psychiatry.org/psychiatrists/practice/dsm

Arnold, D. H. 1997. "Co-Occurrence of Externalizing Behavior Problems and Emergent Academic Difficulties in Young High-Risk Boys: A Preliminary Evaluation of Patterns and Mechanisms." *Journal of Applied Developmental Psychology* 18 (3): 317–330. doi:10.1016/S0193-3973(97)80003-2.

Arnold, L. E., P. Hodgkins, J. Kahle, M. Madhoo, and G. Kewley. 2015. "Long-Term Outcomes of ADHD: Academic Achievement and Performance." *Journal of Attention Disorders* 24 (1): 73–85. doi:10.1177/1087054714566076.

Aunola, K., J. -E. Nurmi, P. Niemi, M. -K. Lerkkanen, and H. Rasku-Puttonen. 2002. "Developmental Dynamics of Achievement Orientations, Reading Performance, and Parental Beliefs." *Reading Research Quarterly* 37 (3): 310–327. doi:10.1598/RRQ.37.3.3.

Aunola, K., T. Onatsu-Arvilommi, and J. -E. Nurmi. 1999. SAQ-C. Unpublished test material.

Aunola, K., H. Stattin, and J. -E. Nurmi. 2000. "Adolescents' Achievement Strategies, School Adjustment, and Externalizing and Internalizing Problem Behaviors." *Journal of Youth and Adolescence* 29 (3): 289–306. doi:10.1023/A:1005143607919.

Barron, K. E., S. W. Evans, L. E. Baranik, Z. N. Serpell, and E. Buvinger. 2006. "Achievement Goals of Students with ADHD." *Learning Disability Quarterly* 29 (3): 137–158. doi:10.2307/30035504.

Birchwood, J., and D. Daley. 2012. "Brief Report: The Impact of Attention Deficit Hyperactivity Disorder (ADHD) Symptoms on Academic Performance in an Adolescent Community Sample." *Journal of Adolescence* 35 (1): 225–231. doi:10.1016/j.adolescence.2010.08.011.

Carlson, C. L., J. E. Booth, M. Shin, and W. H. Canu. 2002. "Parent-, Teacher-, and Self-Rated Motivational Styles in ADHD Subtypes." *Journal of Learning Disabilities* 35 (2): 104–113. doi:10.1177/002221940203500202.

Carr, M., J. G. Borkowski, and S. E. Maxwell. 1991. "Motivational Components of Underachievement." *Developmental Psychology* 27 (1): 108–118. doi:https://doi.org/10.1037/0012-1649.27.1.108.

Crum, K. I., D. A. Waschbusch, and M. T. Willoughby. 2016. "Callous-Unemotional Traits, Behavior Disorders, and the Student–Teacher Relationship in Elementary School Students." *Resource Policy* 24 (1): 16–29. doi:10.1177/1063426615569533.

Diamantopoulou, S., A. -M. Rydell, L. B. Thorell, and G. Bohlin. 2007. "Impact of Executive Functioning and Symptoms of Attention Deficit Hyperactivity Disorder on Children's Peer Relations and School Performance." *Developmental Neuropsychology* 32 (1): 521–542. doi:10.1080/87565640701360981.

DuPaul, G. J., M. J. Gormley, and S. D. Laracy. 2013. "Comorbidity of LD and ADHD: Implications of DSM-5 for Assessment and Treatment." *Journal of Learning Disabilities* 46 (1): 43–51. doi:https://doi.org/10.1177/0022219412464351.

DuPaul, G. J., and J. M. Langberg. 2015. "Educational Impairments in Children with ADHD." In *Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment*, edited by R. A. Barkley, 169–190, New York: The Guilford Press.

Dweck, C. S., and E. Leggett. 1988. "A Social-Cognitive Approach to Motivation and Personality." *Psychological Review* 95 (2): 256–273. doi:10.1037/0033-295X.95.2.256.

Elias, M. J., and N. M. Haynes. 2008. "Social Competence, Social Support, and Academic Achievement in Minority, Low-Income, Urban Elementary School Children." *School Psychology Quarterly* 23 (4): 474–495. doi:10.1037/1045-3830.23.4.474.

Elliot, A. J., and J. M. Harackiewicz. 1996. "Approach and Avoidance Achievement Goals and Intrinsic Motivation: A Mediational Analysis." *Journal of Personality and Social Psychology* 70 (3): 461–475. doi:10.1037/0022-3514.70.3.461.

Elliot, A. J., and C. S. Hulleman. 2017. "Achievement goals." In *Handbook of Competence and Motivation*, *Second Edition: Theory and Application*, edited by A. J. Elliot, C. S. Dweck, and D. S. Yeager, 43–60. New York: The Guilford Press.

Enders, C. K. 2010. *Applied Missing Data Analysis*. New York: Guilford Publications.

Erskine, H., R. Norman, A. Ferrari, G. Chan, W. Copeland, H. Whiteford, and J. Scott. 2016. "Long-Term Outcomes of Attention-Deficit/hyperactivity Disorder and Conduct Disorder: A Systematic Review and Meta-Analysis." *Journal of the American Academy of Child and Adolescent Psychiatry* 55 (10): 841–850. doi:10.1016/j.jaac.2016.06.016.

Fergusson, D. M., L. J. Horwood, and E. M. Ridder. 2007. "Conduct and Attentional Problems in Childhood and Adolescence and Later Substance Use, Abuse and Dependence: Results of a 26-Year Longitudinal Study." *Drug and Alcohol Dependency* 88 (1): 14–26. doi:10.1016/j.drugalcdep.2006.12.011.

Frazier, T. W., E. A. Youngstrom, J. J. Glutting, and W. W. Watkins. 2007. "ADHD and Achievement: Meta-Analysis of the Child, Adolescent and Adult Literatures and a Concomitant Study with College Students." *Journal of Learning Disabilities* 40 (1): 49–65. doi:10.1177/00222194070400010401.

Fried, R., C. Petty, S. Faraone, L. Hyder, H. Day, and J. Biederman. 2016. "Is ADHD a Risk Factor for High School Dropout? A Controlled Study." *Journal of Attention Disorders* 20 (5): 383–389. doi:https://doi.org/10.1177/1087054712473180.

Goodman, R. 1997. "The Strengths and Difficulties Questionnaire: A Research Note." *Journal of Child Psychology and Psychiatry* 38 (5): 581–586. doi:10.1111/j.1469-7610.1997.tb01545.x.

Goodman, R. T., T. Ford, H. Simmons, R. Gatward, and H. Meltzer. 2000. "Using the Strengths and Difficulties Questionnaire (SDQ) to Screen for Child Psychiatric Disorders in a Community Sample." *British Journal of Psychiatry* 177 (6): 534–539. doi:https://doi.org/10.1192/bjp.177.6.534.

Gut, J., C. Heckmann, C. S. Meyer, M. Schmid, and A. Grob. 2012. "Language Skills, Mathematical Thinking, and Achievement Motivation in Children with ADHD, Disruptive Behavior Disorders, and Normal Controls." *Learning and Individual Differences* 22: 375–379. doi:10.1016/j.lindif.2011.12.002.

Hinshaw, S. P. 1992. "Externalizing Behavior Problems and Academic Underachievement in Childhood and Adolescence: Causal Relationships and Underlying Mechanisms." *Psychological Bulletin* 111 (1): 127–155. doi:10.1037/0033-2909.111.1.127.

Hofmann, W., B. J. Schmeichel, and A. D. Baddeley. 2012. "Executive Functions and Self-Regulation." *Trends in Cognitive Sciences* 16 (3): 174–180. doi:10.1016/j.tics.2012.01.006.

Imeraj, L., I. Antrop, E. Sonuga-Barke, D. Deboutte, E. Deschepper, S. Bal, and H. Roeyers. 2013. "The Impact of Instructional Context on Classroom On-Task Behavior: A Matched Comparison of Children with ADHD and Non-ADHD Classmates." *Journal of School Psychology* 51 (4): 487–498. doi:10.1016/j.jsp.2013.05.004.

Jones, E. E., and S. Berglas. 1978. "Control of Attributions About the Self Through Self-Handicapping Strategies: The Appeal of Alcohol and the Role of Underachievement." *Personality & Social Psychology Bulletin* 4 (2): 200–206. doi:10.1177/014616727800400205.

Koskelainen, M. 2008. "The Strengths and Difficulties Questionnaire Among Finnish School-Aged Children and Adolescents." Doctoral diss. University of Turku, Institute of Clinical Medicine: Child Psychiatry. Annales Universitatis Turkuensis D 809 2008-09-05. http://urn.fi/URN:ISBN:978-951-29-3623-6.

Kusurkar, R. A., T. J. Ten Cate, C. M. P. Vos, P. Westers, and G. Croiset. 2013. "How Motivation Affects Academic Performance: A Structural Equation Modelling Analysis." *Advances in Health Sciences Education* 18 (1): 57. doi: https://doi.org/10.1007/s10459-012-9354-3.

Langberg, J. M., S. P. Becker, J. N. Epstein, A. Vaughn, and E. Girio-Herrera. 2013. "Predictors of Response and Mechanisms of Change in an Organizational Skills Intervention for Students with ADHD." *Journal of Child and Family Studies* 22 (7): 1000–1012. doi:https://doi.org/10.1007/s10826-012-9662-5.

Langberg, J. M., J. N. Epstein, M. Altaye, B. S. Molina, L. E. Arnold, and B. Vitiello. 2008. "The Transition to Middle School is Associated with Changes in the Developmental Trajectory of ADHD Symptomatology in Young Adolescents with ADHD." *Journal of Clinical Child & Adolescent Psychology* 37 (3): 651–663. doi:10.1080/15374410802148095.

Lee, J., and S. S. Zentall. 2012. "Reading Motivational Differences Among Groups: Reading Disability (RD), Attention Deficit Hyperactivity Disorder (ADHD), RD+ADHD, and Typical Comparison." *Learning and Individual Differences* 22: 778–785. doi:10.1016/j.lindif.2012.05.010.

Lindeman, J. 1998. *ALLU – Ala-Asteen Lukutesti [Reading Test for Primary School]*. Turku: University of Turku.

Loe, I. M., and H. M. Feldman. 2007. "Academic and Educational Outcomes of Children with ADHD." *Journal of Pediatric Psychology* 32 (6): 643–654. doi:10.1093/jpepsy/jsl054.

Lynam, D. R., and W. Henry. 2001. "The Role of Neuropsychological Deficits in Conduct Disorders." In *Conduct Disorders in Childhood and Adolescence*, edited by J. Hill and B. Maughan, 235–263. Cambridge: Cambridge University Press.

Määttä, S., J. -E. Nurmi, and H. Stattin. 2006. "Achievement Strategies in Peer Groups and adolescents' School Adjustment and Norm-Breaking Behavior." *Scandinavian Journal of Psychology* 47 (4): 273–280. doi:10.1111/j.1467-9450.2006.00517.x.

Mägi, K., P. Häidkind, and E. Kikas. 2010. "Performance-Approach Goals, Task-Avoidant Behaviour and Conceptual Knowledge as Predictors of First graders' School Performance." *Educational Psychology* 30 (1): 89–106. doi:10.1080/01443410903421323.

Martínez, F., C. Barraza, N. Gonzalez, and J. González. 2016. "KAPEAN: Understanding Affective States of Children with ADHD." *Educational Technology & Society* 19 (2): 18–28. https://www.jstor.org/stable/pdf/jeductechsoci.19.2.18.pdf?casa_token=kOSdfUX8kk0AAAAA:_FPgRYCpv7mrSPrIGBgu8esEhct6NFSjpbAB8EWi5qkYySOe-Kjt-0pTeoItVmFzYKNqjSBXifi6QBYcm3gNahISxPFLsmPuEV3AMQ4nViaXP7_4krA

Maughan, B., R. Rowe, J. Messer, R. Goodman, and H. Meltzer. 2004. "Conduct Disorder and Oppositional Defiant Disorder in a National Sample: Developmental Epidemiology the." *Journal of Child Psychology and Psychiatry* 45 (3): 609–621. doi:10.1111/j.1469-7610.2004.00250.x.

McDonough-Caplan, H., D. N. Klein, and T. P. Beauchaine. 2018. "Comorbidity and Continuity of Depression and Conduct Problems from Elementary School to Adolescence." *Journal of Abnormal Psychology* 127 (3): 326–337. doi:10.1037/abn0000339.

Metsäpelto, R. -L., E. Pakarinen, N. Kiuru, A. -M. Poikkeus, M. -K. Lerkkanen, and J. -E. Nurmi. 2015. "Developmental Dynamics Between Children's Externalizing Problems, Task-Avoidant Behavior, and Academic Performance in Early School Years: A 4-Year-Follow-Up." *Journal of Educational Psychology* 107 (1): 246–257. doi:10.1037/a0037389.

Midgley, C., R. Arunkumar, and T. C. Urdan. 1996. ""If I Don't Do Well Tomorrow, There's a Reason": Predictors of Adolescents' Use of Academic Self-Handicapping Strategies." *Journal of Educational Psychology* 88 (3): 423–434. doi:10.1037/0022-0663.88.3.423.

Midgley, C., and T. Urdan. 1995. "Predictors of Middle School students' Use of Self-Handicapping Orientations." *The Journal of Early Adolescence* 15 (4): 389–411. doi:10.1177/0272431695015004001.

Murray, C., and K. M. Murray. 2004. "Child-Level Correlates of Teacher–Student Relationships: An Examination of Demographic Characteristics, Academic Orientations, and Behavioral Orientations." *Psychology in the Schools* 41 (7): 751–762. doi:10.1002/pits.20015.

Muthén, L., and B. O. Muthén. 1998–2013. *Mplus Version 7.01 & Mplus users' Guide*. Los Angeles, CA: Muthén & Muthén.

Närhi, V., P. Lehto-salo, T. Ahonen, and M. Marttunen. 2010. "Neuropsychological Subgroups of Adolescents with Conduct Disorder." *Scandinavian Journal of Psychology* 51 (3): 278–284. doi:10.1111/j.1467-9450.2009.00767.x.

Nigg, J., M. Nikolas, and S. A. Burt. 2010. "Measured Gene-By-Environment Interaction in Relation to Attention-Deficit/hyperactivity Disorder." *Journal of the American Academy of Child & Adolescent Psychiatry* 49 (9): 863–873. doi:10.1016/j.jaac.2010.01.025.

Nurmi, J. E. 1993. "Self-Handicapping and Failure-Trap Strategy: A Cognitive Approach to Problem Behavior and Delinquency." *Psychiatria Fennica* 24: 75–85.

Nurmi, J. -E. 2015. "Toiminta- ja tulkintatavat haasteiden kohtaamisessa ja ongelmien ratkaisemisessa. [Achievement strategies in facing challenges and solving problems]." In *Meitä on moneksi. Persoonallisuuden psykologiset perusteet. [Psychological Basis of Personality]*, edited by R.-L. Metsäpelto and T. Feldt, 111–127. Helsinki: PS-kustannus.

Nurmi, J. -E., K. Aunola, K. Salmela-Aro, and M. Lindroos. 2003. "The Role of Success Expectation and Task-Avoidance in Academic Performance and Satisfaction: Three Studies on Antecedents, Consequences and Correlates." *Contemporary Educational Psychology* 28 (1): 59–90. doi:10.1016/S0361-476X(02)00014-0.

Nurmi, J. -E., T. Onatsu, and T. Haavisto. 1995. "Underachievers' Cognitive and Behavioural Strategies - Self-Handicapping at School." *Contemporary Educational Psychology* 20 (2): 188–200. doi:10.1006/ceps.1995.1012.

Nurmi, J. -E., K. Salmela-Aro, and T. Haavisto. 1995. "The Strategy and Attribution Questionnaire: Psychometric Properties 1the Preparation of This Article Was Supported by a Grant from the Social Science Research Council of Finland. We are Grateful to Michael Berzonsky for His Helpful Comments on an Earlier Draft." *European Journal of Psychological Association* 11 (2): 108–121. doi:10.1027/1015-5759.11.2.108.

Nurmi, J. -E., K. Salmela-Aro, and H. Ruotsalainen. 1994. "Cognitive and Attributional Strategies Among Unemployed Young Adults: A Case of the Failure-trap Strategy." *European Journal of Personality* 8 (2): 135–148. doi:10.1002/per.2410080205.

Official Statistics of Finland [OSF]. 2013. *Educational Structure of Population*. Helsinki: Statistics Finland. ISSN=2242-2919. http://stat.fi/til/vkour/2013/vkour_2013_2014-11-06_tie_001_en.

Olivier, M. A. J., and D. S. Steenkamp. 2004. "Attention-Deficit/hyperactivity Disorder: Underlying Deficits in Achievement Motivation." *International Journal for the Advancement of Counselling* 26 (1): 47–63. doi:10.1023/B:ADCO.0000021549.40409.c4.

Onatsu-Arvilommi, T., and J. -E. Nurmi. 2000. "The Role of Task-Avoidant and Task focused Behaviors in the Development of Reading and Mathematical Skills During the First School Year: A Cross-Lagged Longitudinal Study." *Journal of Educational Psychology* 92 (3): 478–491. doi:10.1037/0022-0663.92.3.478.

Pakarinen, E., N. Kiuru, M. -K. Lerkkanen, A. -M. Poikkeus, T. Ahonen, and J. -E. Nurmi. 2011. "Instructional Support Predicts Children's Task Avoidance in Kindergarten." *Early Childhood Research Quarterly* 26 (3): 376–386. doi:10.1016/j.ecresq.2010.11.003.

Palmu, I., V. Närhi, and H. Savolainen. 2018. "Externalizing Behaviour and Academic Performance: The Cross-Lagged Relationship During School Transition." *Emotional and Behavioural Difficulties* 23 (2): 111–126. doi:10.1080/13632752.2017.1376968.

Pietarinen, J., K. Pyhältö, and T. Soini. 2010. "A Horizontal Approach to School Transitions: A Lesson Learned from the Finnish 15-Year-Olds." *Cambridge Journal of Education* 40 (3): 229–245. doi:10.1080/0305764X.2010.506145.

Polanczyk, G. V., E. G. Willcutt, G. A. Salum, C. Kieling, and R. A. Rohde. 2014. "ADHD Prevalence Estimates Across Three Decades: An Updated Systematic Review and Meta-Regression Analysis." *International Journal of Epidemiology* 43 (2): 434–442. doi:10.1093/ije/dyt261.

Polderman, T. J. C., D. I. Boomsma, M. Bartels, F. C. Verhulst, and A. C. Huizink. 2010. "A Systematic Review of Prospective Studies on Attention Problems and Academic Achievement." *Acta Psychiatrica Scandinavica* 122 (4): 271–284. doi: https://doi.org/10.1111/j.1600-0447.2010.01568.x.

Ramtekkar, U. P., A. M. Reiersen, A. A. Todorov, and R. D. Todd. 2010. "Sex and Age Differences in Attention-Deficit/hyperactivity Disorder Symptoms and Diagnoses: Implications for DSM-V and ICD-11." *Journal of the American Academy of Child and Adolescent Psychiatry* 49 (3): 217–228. doi:10.1016/j.jaac.2009.11.011.

Räsänen, P. 2004. *RMAT-Laskutaidon Testi 9-12-Vuotiaille: Käsikirja [A Mathematical Achievement Test for 9-12-Year-Olds: Manual]*. Jyväskylä: Niilo Mäki Institute.

Reid, R., J. E. Gonzalez, P. D. Nordness, A. Trout, and M. H. Epstein. 2004. "A Meta-Analysis of the Academic Status of Students with Emotional/Behavioral Disturbance." *The Journal of Special Education* 38 (3): 130–144. doi:10.1177/00224669040380030101.

Rodriguez, A., M. Järvelin, C. Obel, A. Taanila, J. Miettunen, I. Moilanen, T. B. Henriksen, et al. 2007. "Do Inattention and Hyperactivity Symptoms Equal Scholastic Impairment? Evidence from Three European Cohorts." *BMC Public Health* 7 (1): 327. doi:10.1186/1471-2458-7-327.

Roeser, R., J. Eccles, and K. Strobel. 1998. "Linking the Study of Schooling and Mental Health: Selected Issues and Empirical Illustrations at the Level of the Individual." *Educational Psychologist* 33 (4): 153–176. doi:https://doi.org/10.1207/s15326985ep3304_2.

Rogers, M., V. Bélanger-Lejars, R. Toste, and N. L. Heath. 2015. "Mismatched: ADHD Symptomatology and the Teacher–Student Relationship." *Emotional and Behavioural Difficulties* 20 (4): 333–348. doi:10.1080/13632752.2014.972039.

Smith, Z. R., and J. M. Langberg. 2018. "Review of the Evidence for Motivation Deficits in Youth with ADHD and Their Association with Functional Outcomes." *Clinical Child and Family Psychology Review* 21 (4): 500–526. doi:10.1007/s10567-018-0268-3.

Spilt, J., and H. Koomen. 2009. "Widening the View on Student– Teacher Relationships: Teachers' Narratives Concerning Disruptive versus Nondisruptive Children." *School Psychology Review* 38 (1): 86–101. doi:10.1080/02796015.2009.12087851.

Teichner, G., and C. J. Golden. 2000. "The Relationship of Neuropsychological Impairment to Conduct Disorder in Adolescence: A Conceptual Review." *Aggression and Violent Behavior* 5 (6): 509–528. doi:10.1016/S1359-1789(98)00035-4.

Thapar, A., and M. Cooper. 2016. "Attention Deficit Hyperactivity Disorder." *The Lancet* 387 (19): 1240–1250. doi:10.1016/S0140-6736(15)00238-X.

Torvik, F. A., E. M. Eilertsen, T. A. McAdams, Gustavson, K., Zachrisson, H.D., Brandlistuen, R., Gjerde, R.C., Havdahl, A., Stoltenberg, C., Ask, H., et al. 2020. "Mechanisms Linking Parental Educational Attainment with Child ADHD, Depression, and Academic Problems: A Study of Extended Families in the Norwegian Mother, Father and Child Cohort Study." *Journal of Child Psychology and Psychiatry* 61 (9): 1009–1018. doi:10.1111/jcpp.13197.

White, B., M. Jarrett, and T. Ollendick. 2013. "Self-Regulation Deficits Explain the Link Between Reactive Aggression and Internalizing and Externalizing Behavior Problems in Children." *Journal of Psychopathology and Behavioral Assessment* 35 (1): 1–9. doi:10.1007/s10862-012-9310-9.

Zee, M., P. F. de Jong, and H. M. Koomen. 2017. "From Externalizing Student Behavior to Student-Specific Teacher Self-Efficacy: The Role of Teacher-Perceived Conflict and Closeness in the Student-Teacher Relationship." *Contemporary Educational Psychology* 51: 37–50. doi:10.1016/j.cedpsych.2017.06.009.

Zentall, S. S., and S. M. Beike. 2012. "Achievement and Social Goals of Younger and Older Elementary Students: Response to Academic and Social Failure." *Learning Disability Quarterly* 35 (1): 39–53. doi:10.1177/0731948711429009.

Zhang, X., J. -E. Nurmi, N. Kiuru, M. -K. Lerkkanen, and K. Aunola. 2011. "A Teacher-Report Measure of Children's Task-Avoidant Behavior: A Validation Study of the Behavioral Strategy Rating Scale." *Learning and Individual Differences* 21 (6): 690–698. doi:10.1016/j.lindif.2011.09.007.

Zimmermann, F., K. Schütte, P. Taskinen, and O. Köller. 2013. "Reciprocal Effects Between Adolescent Externalizing Problems and Measures of Achievement." *Journal of Educational Psychology* 105 (3): 747–761. doi:https://doi.org/10.1037/a0032793.

Zuckerman, M., S. C. Kieffer, and C. R. Knee. 1998. "Consequences of Self-Handicapping: Effects on Coping, Academic Performance, and Adjustment." *Journal of Personality and Social Psychology* 74 (6): 1619–1628. doi:https://doi.org/10.1037/0022-3514.74.6.1619.