The bidirectional pathways between internalizing and externalizing problems and academic performance from 6 to 18 years

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ABSTRACT

Internalizing and externalizing problems are associated with poor academic performance, both concurrently and longitudinally. Important questions are whether problems precede academic performance or vice versa, whether both internalizing and externalizing are associated with academic problems when simultaneously tested, and whether associations and their direction depend on the informant providing information. These questions were addressed in a sample of 816 children who were assessed four times. The children were 6-10 years at baseline and 14-18 years at the last assessment. Parent-reported internalizing and externalizing problems and teacher-reported academic performance were tested in cross-lagged models to examine bidirectional paths between these constructs. These models were compared with cross-lagged models testing paths between teacher-reported internalizing and externalizing problems and parent-reported academic performance. Both final models revealed similar pathways from mostly externalizing problems to academic performance. No paths emerged from internalizing problems to academic performance. Moreover, paths from academic performance to internalizing and externalizing problems were only found when teachers reported on children's problems and not for parent-reported problems. Additional model tests revealed that paths were observed in both childhood and adolescence. Externalizing problems place children at increased risk of poor academic performance and should therefore be the target for interventions.

INTRODUCTION

Problem behaviors have a large impact on children's functioning and quality of life and are a great burden to their families, their environment, and to society at large (Costello, Egger, & Angold, 2005). Moreover, there is considerable evidence that many life-time adult psychiatric disorders have their onset in childhood (Jones, 2013). Children with psychiatric disorders have an increased risk of adult disorders and of maladjustments in areas such as work, social relations, law, and physical health (Costello & Maughan, 2015). An important path leading from children's problems to adverse outcomes in adulthood is through poor school attainment such as failing to complete school or achieving low school grades. Educational failure has been associated with lower income, unemployment, mortality, poor health status, and subjective outcomes such as happiness and perceived quality of life (McLeod & Kaiser, 2004; Riglin, Petrides, Frederickson, & Rice, 2014). However, to successfully intervene in the detrimental cycle from problem behavior to educational attainment or vice versa depends on understanding how this cycle is operating. There is evidence that improving the educational environment early in childhood age is beneficial in reducing adverse outcomes such as substance use, violence, and unemployment in adulthood (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Reynolds, Temple, Ou, & et al., 2007), but more research is needed to determine when interventions could be most promising.

Internalizing and externalizing

In our study we focus on the major division of problem behavior into two dimensions: internalizing and externalizing problems. When we use the term "problems" we refer to continuous scores of problem behavior, i.e., mostly the result of summed item scores of rating scales. We use the term "disorders" to denote categorical outcomes based on clinical or interview-derived diagnoses. Internalizing problems are characterized by symptoms related to anxiety and depression, whereas externalizing problems cover problem areas such as aggression, defiance, and drug abuse. This subdivision is demonstrated in studies of children (Achenbach, 2009) as well as in studies of adults (Krueger & Markon, 2006). Disorders comprising this division affect many children worldwide. Prevalence estimates of internalizing disorders are 6.5% for anxiety disorders and 2.6% for depressive disorders. For externalizing disorders the prevalence estimate is 5.7% (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). Although internalizing and externalizing emerge as separate dimensions, their co-occurrence is still considerable (Krueger & Markon, 2006). The overlap between the two dimensions warrants investigating internalizing and externalizing problems simultaneously. A number of previous studies examining bidirectional links between problem behavior and academic performance included only internalizing or only externalizing problems. However, only jointly studying both internalizing and

externalizing problems accounts for the cross-sectional as well as the longitudinal co-occurrence of internalizing and externalizing problems.

Problem behavior and educational outcomes

It has been well established that children's internalizing and externalizing problems are negatively related to academic performance concurrently (see Moilanen, Shaw, & Maxwell, 2010; Riglin, et al., 2014). In addition, the number of studies investigating longitudinal associations between these two domains is increasing, but the reports about these associations provide mixed results (Leach & Butterworth, 2012; McLeod & Fettes, 2007; Needham, 2009; Patalay, Deighton, Fonagy, & Wolpert, 2015; Veldman, et al., 2014). A meta-analysis reported significant, but small effects of internalizing problems on educational attainment (Riglin, et al., 2014). The findings from the summarized studies suggested that the association of depression with educational outcomes was stronger than that of anxiety and that the associations of internalizing problems with school failure were stronger than those with school grades. The meta-analysis did not examine the reverse effects, i.e., whether educational attainment predicts internalizing problems. In contrast, the meta-analysis of Esch, et al. (2014) summarized studies that examined whether school dropout predicted problem behavior and the reverse. Their findings suggested that mostly externalizing problems predicted school dropout, whereas internalizing problems were often a consequence of school dropout. Because studies investigating the path from problem behavior to school dropout outnumbered studies examining paths in the opposite direction and studies did not analyze both paths simultaneously, it is, however, difficult to draw firm conclusions regarding the direction of the pathways. Thus, for a better understanding of the pathways between problem behavior and academic performance, both directions of these pathways should be tested simultaneously in one study with long follow-up and repeated measures of internalizing and externalizing problems as well as academic performance.

Competing Models

Determining the direction between problem behavior and academic performance is essential to evaluate the validity of two competing models: the adjustment erosion hypothesis versus the academic incompetence hypothesis (Moilanen, et al., 2010). The adjustment erosion hypothesis refers to the mechanism that internalizing or externalizing problems lead to lower later academic performance, which increases risks for problems in other domains later in life. On the other hand, the academic incompetence hypothesis posits that poor academic performance provoke later internalizing or externalizing problems resulting in multiple adverse outcomes. Alternatively, shared risk factors may underlie high levels of problem behavior or poor academic performance, which may aggravate functioning further (Moilanen, et al., 2010).

Testing bidirectional pathways

Cross-lagged models are an important tool to examine bidirectional effects. These models enable testing whether a construct has an effect on another construct assessed at a later occasion second construct or the reverse of this effect. It is further possible to test whether both the effect and its reverse are present simultaneously. At the same time cross-lagged models account for concurrent relations between two different variables and for stability paths between variables of the same type (Selig & Little, 2012). Thus, cross-lagged models can disentangle whether, for example, internalizing problems precede academic performance or vice versa, while they take into account the stabilities over time. We therefore used cross-lagged models as the main vehicle for our analyses.

Bidirectional pathways between problem behavior and academic performance

Numerous studies tested the direction of the paths between problem behavior and academic performance using cross-lagged models (Burt & Roisman, 2010; Chen, Huang, Chang, Wang, & Li, 2010; Defoe, Farrington, & Loeber, 2013; Englund & Siebenbruner, 2012; Lee, 2013; Masten, Desjardins, McCormick, Kuo, & Long, 2010; Masten, et al., 2005; Metsäpelto, et al., 2015; Moilanen, et al., 2010; Obradović, Burt, & Masten, 2010; Riglin, Frederickson, Shelton, & Rice, 2013; Vaillancourt, Brittain, McDougall, & Duku, 2013; van Lier, et al., 2012; Verboom, Sijtsema, Verhulst, Penninx, & Ormel, 2014; Zimmermann, Schutte, Taskinen, & Koller, 2013). Regarding the path from internalizing or externalizing problems to academic performance, these studies reported mixed results. A longitudinal association of externalizing problems with academic performance was found in most studies, which supports the adjustment erosion hypothesis. However, these studies did not find a pathway from internalizing problems. Further, these bidirectional studies found some, but no consistent evidence for an independent path from academic performance to internalizing or externalizing problems. Arguably, the academic incompetence hypothesis received less support than the adjustment erosion hypothesis.

Pertaining to these mixed results are the many differences among the studies. For example, some studies only examined internalizing problems and not externalizing problems in the relation with academic performance. These studies (Obradović, et al., 2010; Verboom, et al., 2014) found pathways from internalizing problems to academic performance, a pathway that only emerged once (Englund & Siebenbruner, 2012) in those studies that investigated internalizing and externalizing problems jointly. The pathway could thus be due to lack of accounting for externalizing problems in the analysis. In line with this interpretation, the meta-analysis of Esch, et al. (2014) indicated that the association between internalizing disorders and educational attainment was strongly mediated by co-occurring disruptive behavior problems, whereas independent effects could not

be observed. To account for this inter-relation, we tested internalizing and externalizing problems simultaneously in the relation with academic performance.

A further difference among the studies is the inclusion of mediating variables such as self-esteem, task-avoidant behavior, social competence, and victimization. A mediator can account for part or most of the association between problem behavior and subsequent academic performance. If the model without the mediators is not presented or not fully adjusted, the unmediated overall association cannot be evaluated. For example, Metsäpelto, et al. (2015) found paths from externalizing problems to task-avoidant behavior and paths from task-avoiding behavior to academic performance. Direct paths between externalizing problems and academic problems were not presented in this study. In addition, van Lier, et al. (2012) and Vaillancourt, et al. (2013) reported conflicting findings regarding the direction of the pathways between problem behavior and academic performance. Both studies included victimization as a mediator; this presentation could have masked the overall the existence of pathways between problem behavior and academic performance. Although investigating mediators is in itself very meaningful, studies should report the overall results for direct and indirect associations to enable comparisons with other studies without these mediators. Our study aimed at providing a basic model without mediating pathways to test the two competing hypotheses.

Previous studies also varied much in how and whether ratings from multiple informants were incorporated. For example, many studies used only one type of informant of both problem behavior and academic performance (Lee, 2013; van Lier, et al., 2012), others combined reports from multiple informants on outcome or determinant into latent variables (Masten, et al., 2005; Moilanen, et al., 2010), or changed the type of informant across waves (Englund & Siebenbruner, 2012). Using both ratings of problem behavior and academic performance obtained from the same informant can strongly inflate associations (Ringoot, et al., 2015). Latent variables that also include ratings of the same informant as indicators of problem behavior or of academic performance can lead to inflated associations as well, although probably to a lesser degree, because of the shared variance between the different latent variables. To circumvent the problem of shared method variance it is important to have different informants of problem behavior versus academic performance. Because there is low-to-moderate correspondence between different types of informants of problem behavior (Achenbach, McConaughy, & Howell, 1987), we argue that it is also important to examine separate models with different informants of problem behavior. In this way only, both consistency and validity of the pathways between problem behavior and academic performance can be investigated. In the current study this is achieved by contrasting two models, one model with parent-reported problem behavior and teacher-reported academic performance and the reversed model, with the same informants but now using teacher-reported problem behavior and parent-reported academic performance. It should be noted, however, that different teachers reported

about an individual at each time point. The mean correlation between the ratings of two different teachers is .64 (Achenbach, et al., 1987).

Age and gender effects

Bidirectional paths between internalizing and externalizing problems and academic performance can differ across age groups. A possible reason for age differences may be the higher prevalence of disorders in adolescence (12 to 16 years) as compared to childhood (4 to 11 years, Offord, et al., 1987). Further, academic performance may be more demanding in adolescence than in childhood. Because of the higher prevalence of disorders and more demanding academic performance in adolescence, the bidirectional pathways may be stronger in this developmental period as well. Chen, et al. (2010) suggested that bidirectional paths involving externalizing problems were stronger in children who were 8-10 years than in children who were 10-12 years. In contrast, Obradović, et al. (2010) reported no differences in pathways with respect to internalizing problems in children aged 8-12 years. Only few studies tested age differences and findings were inconsistent. We therefore tested age differences using 12 years as the cut-point between childhood and adolescence. This cut-point also marks the transition from primary school to secondary school in the Netherlands.

Because levels of internalizing and externalizing problems differ between boys and girls and associations of these problems with an outcome such as academic performance may differ between boys versus girls, it is important to examine gender differences (Zahn-Waxler, 1993). Verboom, et al. (2014) only found bidirectional links between depressive problems and academic performance in girls. However, Obradović, et al. (2010) reported a contradicting finding. A pathway from internalizing problems to academic performance was only present in boys. In addition, Masten, et al. (2005) found gender differences in cross-sectional associations, but not in bidirectional pathways between internalizing, externalizing, and academic performance. However, most previous studies testing gender differences found no differences in the cross-lagged paths or the stabilities between boys and girls (Burt & Roisman, 2010; Chen, et al., 2010; Englund & Siebenbruner, 2012; Masten, et al., 2010; Metsäpelto, et al., 2015; Vaillancourt, et al., 2013; van Lier, et al., 2012). These contradicting previous findings warrant further tests of differences between boys and girls in bidirectional pathways of internalizing problems, externalizing problems, and academic performance in the current study.

The current study

In the present study we tested bidirectional pathways between problem behavior and academic performance using longitudinal data obtained from a large population-based cohort. The study used reports on children's internalizing problems, externalizing prob-

lems, and academic performance obtained from parents and teachers collected when children were 6-10 years at the first and 12-18 years at the last of four waves.

The current study enhances previous studies in several ways. First, we used different informants of problem behavior and academic performance in one model to avoid shared method variance. Second, we also tested the same model in which we interchanged the two informants on behavioral problems and academic performance. This enabled us to examine consistencies between informants. Third, we used identical measurement instruments across waves and informants. Fourth, our study covered an age range of 6-18 years, which is longer a follow-up time than in most previous studies. The study encompasses two developmental periods, namely childhood and adolescence. Because age differences were not often examined and findings were not clear, we tested whether bidirectional paths between problem behavior and academic performance differed between ages 6 to 12 years versus 13 to 18 years. Fifth, we examined internalizing and externalizing problems simultaneously in the relation with academic performance.

We expected to find paths from externalizing problems to academic performance, because that is the most salient finding from previous studies. Findings for internalizing problems are less clear; we hypothesized that no paths involving internalizing problems would be found in this large study with a rigorous methodological approach.

METHOD

Sample

The study was embedded in the Zuid-Holland Study that started in 1983. Details of the initial data collection were described in Verhulst, Akkerhuis, and Althaus (1985). The study addresses behavioral and emotional problems in children and adolescents. In the remainder of the text we will refer to children and adolescents as children. In 1983, a random sample of 2,600 children stratified according to gender and birth year (i.e., children aged 4-16 years) was drawn from municipal registers that listed all residents in the Dutch province of Zuid-Holland. Of the 2,447 parents reached, 2,076 (i.e., 84.8%) provided usable data. We obtained no response in 524 children. Of these, 78 children lived in municipal communities that refused to give information, 357 children had parents who refused to participate or did not respond, parents of 8 children could not respond because of language difficulties, 6 children lived in a foster family or residential setting refusing cooperation, while the remaining 75 children were untraceable (e.g., moved, house was empty, or wrong address). There were no differences in gender and age between responders and non-responders, whereas non-responders comprised slightly more families with low socio-economic status (SES) than responders (Verhulst, et al., 1985). The 2,076 children in the final sample comprised 48.9% boys, were on average 9.9

years, were mostly of North-European descent (96.6%), and 34.1% of them were lived in families of low SES. The cohort was approached every two years from 1983 to 1991 (wave 1 to wave 5). Participants provided written informed consent after fully explaining the procedures. The local medical ethical committee has approved the initial study and all follow-up waves.

This analysis focused on the comparison of parent and teacher ratings of internalizing and externalizing problems. Therefore, we used data from wave 1 to wave 5, because these waves, that span 8 years, included ratings from both informants. Because we did not obtain teacher data on wave 2 we did not include data from that wave. In addition, we selected children who were 6-10 years on wave 1, because in these children we obtained parent- and teacher-ratings of problem behavior and academic performance in the 4 waves. The total number of children in the selected sample is 816. The selected sample comprised 49.5% boys, were on average 8.1 years, were mostly of North-European descent (97.5%), and 33.5% of them lived in families of low SES. A logistic regression analysis of selected and non-selected children did not reveal any differences on sex, ethnicity, and SES. The time interval between wave 1 and wave 3 was 4 years, whereas time intervals between wave 3 and wave 4 and between wave 4 and wave 5 were 2 years. The combination of waves and ages resulted in an age span of 12 years, from 6 to 18 years. Figure 1 shows how waves and ages are related. For example, children who were 6 years at the first wave, were 12 years at the last wave, and children who were initially 10 years, were 18 years at the end of the follow-up. Table 1 shows the number of children per study variable and wave. Out of 8 possible parent and teacher ratings, 6 to 8 ratings were obtained in 75% of the sample. We used logistic regression to test whether children with complete information differed from children with incomplete information. There were no differences regarding ethnicity and regarding parent-reported internalizing and externalizing problems at wave 1. However, compared to children with complete information, children with incomplete information were more often boys (OR=1.5, p=.024), were older (OR=1.4, p<.001), and were more often from families with low SES (OR=.9, p<.009).

Measures

Internalizing and externalizing problems

All ratings of emotional and behavioral problems were based on Dutch translations of the Child Behavior Checklist (CBCL) and the Teacher's Report Form (TRF; Achenbach & Rescorla, 2001). These measures have large overlaps of item content across informants. All instruments were translated into Dutch and back-translated into English (Verhulst, et al., 1985). The items of the measures are rated on a three-point scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). The item scores are summed to form scales with continuous scores. For this study we used the scales Internalizing, com-

prising anxiety and depressive problems, and Externalizing, comprising aggressive and rule-breaking behavior. In the remainder of the text we refer to the scales of the CBCL and TRF when we use the terms "internalizing problems" or "externalizing problems". The range of Cronbach's alphas of scores for Internalizing is from .81 to .90 and of scores for Externalizing is from .81 to .92 across waves and informants. Of the 816 children in the selected sample, 107 (13.1%) had scores above the clinical cut-off on parent-reported internalizing problems and 123 (15.1%) on parent-reported externalizing problems (Verhulst, Van der Ende, & Koot, 1996).

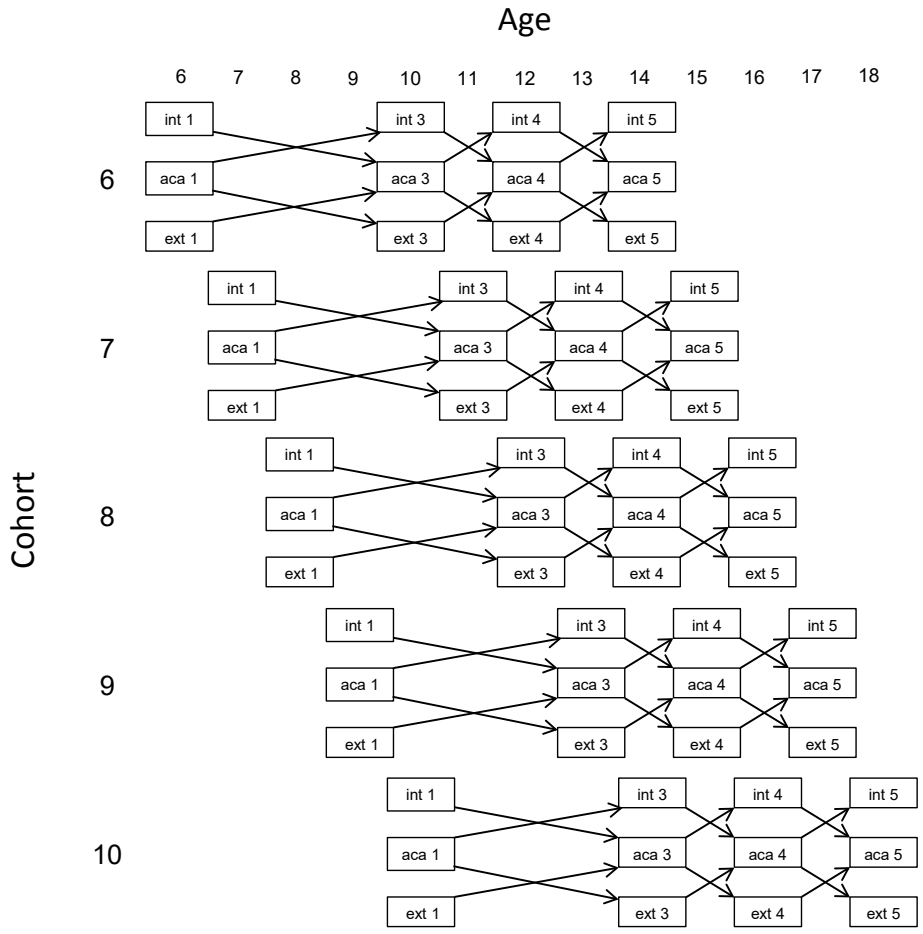

Figure 1. Overview of the assessments across waves, cohorts, and ages; int = internalizing problems, ext = externalizing problems, aca = academic performance, numbers within boxes indicate waves

Academic performance

Both the CBCL and TRF contain items that assess academic performance. Both parents and teacher can rate seven items on graded subjects. Parents also indicate whether a child repeated a grade, received special education, or had academic problems. The school scale of the CBCL is a combination of the graded subjects and the additional items. The test-retest reliability of the scores on the scale is .83. The academic performance scale of the TRF is the sum of the graded subjects. The test-retest reliability of the scores on the scale is .89. Because the school scale of the CBCL is very similar to the academic performance scale of the TRF, we refer to both scales with the term "academic performance" in the remainder of the text.

Table 1. Means of parent-reported internalizing problems, parent-reported externalizing problems, teacher-reported academic performance, teacher-reported internalizing problems, teacher-reported externalizing problems, and parent-reported academic performance across waves.

Time	Informant	Scale	Mean	Std. Deviation	*N*
Time 1	Parent	Internalizing	5.5	5.3	816
	Parent	Externalizing	8.4	7.4	816
	Parent	Academic Performance	5.1	1.0	716
	Teacher	Internalizing	5.9	6.1	667
	Teacher	Externalizing	5.4	7.6	667
	Teacher	Academic Performance	3.4	.6	660
Time 3	Parent	Internalizing	5.2	5.3	669
	Parent	Externalizing	6.0	6.1	669
	Parent	Academic Performance	4.9	1.1	664
	Teacher	Internalizing	6.0	6.3	543
	Teacher	Externalizing	4.9	8.4	543
	Teacher	Academic Performance	3.3	.8	521
Time 4	Parent	Internalizing	5.4	5.3	691
	Parent	Externalizing	6.2	6.2	691
	Parent	Academic Performance	4.8	1.0	681
	Teacher	Internalizing	5.5	6.0	532
	Teacher	Externalizing	4.8	8.5	532
	Teacher	Academic Performance	3.1	.7	523
Time 5	Parent	Internalizing	5.4	5.3	666
	Parent	Externalizing	5.8	6.2	666
	Parent	Academic Performance	4.5	1.0	617
	Teacher	Internalizing	5.9	6.5	463
	Teacher	Externalizing	4.7	8.2	463
	Teacher	Academic Performance	3.0	.7	440

Mostly mothers completed the CBCL. Across waves they provided 86.8%-93.5% of the ratings. In 82.0 to 87.3% of the cases, mothers completed the CBCL on adjacent waves. Different teachers of the same individual completed the TRF across waves.

Covariates

Gender was included as a dichotomous variable with boys as the reference category. Parents' socio-economic status (SES) was determined at the first wave. SES was indicated by achieved occupational level scored on a scale from 1 to 6 with 1 representing unskilled employees and 6 executives or major professionals (Westerlaak, Kropman, & Collaris, 1975).

Data analysis

Our hypotheses were tested with autoregressive cross-lagged or transactional models (Selig & Little, 2012). In such models, the autoregressive paths reflect the continuity within a specific variable. In addition, the cross-time, cross-lagged paths between different variables are estimated. Significant cross-lagged paths indicate directional effects between different variables above and beyond the autoregressive or stability paths of these variables from one time to the next. The models also include covariances between concurrent variables as well as gender and parents' socio-economic status as covariates.

All models were fitted in Mplus version 7.3 (Muthén & Muthén, 1998-2012). A robust maximum likelihood (MLR) estimator, which produces robust standard errors, was used to account for possible non-normal distribution of the study variables. We standardized each score before including them into the analyses. The standardization is convenient in comparing effect estimates. To determine model fit, we used the comparative fit index (CFI) and Tucker–Lewis index (TLI), with values > .90 indicating acceptable fit and values > .95 indicating close fit (Bentler & Bonett, 1980), and the root mean square error of approximation (RMSEA), with values between .08 and .06 indicating acceptable fit and values < .06 indicating close fit (Browne & Cudeck, 1992). Missing data were handled using full information maximum likelihood estimation.

We tested two series of each four models. The first series examined the paths between parent-reported internalizing problems, parent-reported externalizing problems, and teacher-reported academic performance. In each series, the first model was an unconstrained model, in which all paths across waves and cohorts and all covariances were freely estimated. In the second model we constrained paths to be equal when they were between both identical constructs and equal follow-up periods. The paths, for example, between time 3 internalizing problems and time 4 internalizing problems and between time 4 internalizing problems and time 5 internalizing problems were constrained to be equal, but were unequal to the path between time 1 internalizing problems and time 3 internalizing problems, which concerns a longer follow-up period. Paths across cohorts,

i.e. ages at wave 1 (see figure 1), however, were still allowed to be different. These paths were constrained to be equal in model 3. Thus, the path between time 3 externalizing problems and time 4 academic performance was held to be the same across cohort 6 to 10. In addition to the paths, the covariances between concurrent constructs were also constrained to be equal across cohorts. The fourth model tested whether paths in childhood were different from paths in adolescence. Paths before age 12 years were allowed to be different from paths after age 12 years. The second series of models was based on teacher-reported internalizing problems, teacher-reported externalizing problems, and parent-reported problems with the same four-step model approach.

We conducted multi-group analyses to test whether there were model differences between boys and girls. For our previous model tests we defined separate groups for each of the five cohorts, thus further distinguishing between boys and girls doubled the number of groups to ten. To circumvent small sample sizes we decided to collapse the cohorts into one group and to integrally test gender invariance in separate boy and girl groups. First we tested a model in which all bidirectional pathways of parent-reported internalizing and externalizing problems and parent-reported academic performance between boys and girls were constrained. Next we tested a model in which these pathways were freely estimated. We repeated these tests of gender invariance with models of teacher-reported internalizing and externalizing problems and parent-reported academic performance.

Differences between the models were tested with a χ^2 difference test. Because the MLR estimator was used, a standard test could not be applied. Instead, we followed the steps provided on the website for Mplus (Chi-square, n.d.) to compute an adapted χ^2 difference test.

RESULTS

Preliminary analyses

Descriptive statistics of the study variables are given in table 1. The means of the constructs were similar across waves. Table 1 also shows the number of individuals with valid data per construct and wave.

Correlations between the study variables across waves are given in table 2. Stabilities (i.e., correlations between the same constructs assessed across time) are all high. However, stabilities between teacher reports are lower than stabilities between parent reports. This difference is due to the fact that per individual the teachers virtually always differed across wave, whereas parents were largely identical reporters (>85% mother). In the Dutch primary education system until age 12 years, teachers change each academic year; similar changes occur in secondary school. As expected, internalizing and externalizing problems were negatively associated with academic performance.

Table 2. Correlations among parent-reported internalizing problems, parent-reported externalizing problems, and teacher-reported academic performance in the lower triangle and among teacher-reported internalizing problems, teacher-reported externalizing problems, and parent-reported academic performance in the upper triangle.

				Time 1			Time 3			Time 4			Time 5
		Int	**Ext**	**Aca**	**Int**	**Ext**	**Aca**	**Int**	**Ext**	**Aca**	**Int**	**Ext**	**Aca**
Time 1	Internalizing		**0.35**	**-0.23**	**0.14**	0.01	**-0.20**	**0.23**	0.05	**-0.15**	**0.13**	0.00	**-0.15**
	Externalizing	**0.53**		**-0.32**	0.01	**0.36**	**-0.27**	**0.10**	**0.38**	**-0.22**	0.10	**0.29**	**-0.26**
	Academic Performance	**-0.09**	**-0.20**		**-0.10**	**-0.28**	**0.52**	**-0.20**	**-0.26**	**0.50**	**-0.14**	**-0.27**	**0.46**
Time 3	Internalizing	**0.53**	**0.38**	**-0.13**		**0.37**	**-0.17**	**0.27**	0.07	**-0.17**	**0.26**	0.01	**-0.12**
	Externalizing	**0.37**	**0.66**	**-0.16**	**0.54**		**-0.24**	**0.18**	**0.51**	**-0.24**	0.03	**0.40**	**-0.27**
	Academic Performance	-0.01	**-0.22**	**0.41**	-0.05	**-0.19**		**-0.19**	**-0.25**	**0.66**	**-0.15**	**-0.20**	**0.52**
Time 4	Internalizing	**0.52**	**0.35**	**-0.11**	**0.69**	**0.43**	-0.06		**0.37**	**-0.25**	**0.25**	**0.11**	**-0.15**
	Externalizing	**0.33**	**0.60**	**-0.20**	**0.43**	**0.73**	**-0.17**	**0.51**		**-0.32**	**0.18**	**0.62**	**-0.36**
	Academic Performance	0.00	**-0.13**	**0.22**	**-0.12**	**-0.20**	**0.34**	**-0.16**	**-0.25**		**-0.15**	**-0.23**	**0.67**
Time 5	Internalizing	**0.44**	**0.28**	**-0.12**	**0.57**	**0.30**	-0.02	**0.68**	**0.37**	**-0.10**		**0.37**	**-0.17**
	Externalizing	**0.27**	**0.53**	**-0.19**	**0.35**	**0.62**	**-0.15**	**0.35**	**0.73**	**-0.21**	**0.51**		**-0.36**
	Academic Performance	0.05	-0.08	**0.13**	-0.07	**-0.13**	**0.20**	-0.04	**-0.20**	**0.32**	**-0.17**	**-0.33**	

Correlations in bold are significant at $p<.05$
Int = Internalizing Problems, Ext = Externalizing Problems, Aca = Academic Performance

Cross-lagged models

Table 3 shows the results of the tests among the models within the two series of each four models. The first series concerns the models (1A through 1D) describing the paths between parent-reported internalizing problems, parent-reported externalizing problems, and teacher-reported academic problems. Models 1B, 1C, 1D in this series have acceptable (CFI≥.90, TLI≥.90, RSMEA≤.80) to good (CFI≥.95, TLI≥.95, RMSEA≤.50) fit, whereas the TLI and RMSEA of model 1A are respectively somewhat below or above these thresholds. When comparing the models with χ^2 difference tests, model 1C in which paths are constrained across waves and cohorts was the best fitting model.

The second series of models (2A through 2D) in table 3 concern pathways between teacher-reported problem behavior and parent-reported academic performance. The fit measures of the models in the second series are slightly worse than those in the first series. The CFIs and RMSEAs indicate acceptable fit, whereas the TLIs are below the threshold. The χ^2 difference tests favor model 2C, in line with the favored model of the first series. We thus selected models 1C and 2C as the final models.

A formal comparison between models 1C and 1D and between models 2C and 2D tests whether pathways before age 12 years were different from pathways after age 12 years (the D models). The χ^2 difference tests suggest that there are no age differences (the C models).

Table 3. Fit statistics of and comparisons between cross-lagged models of bidirectional paths between internalizing problems, externalizing problems, and academic performance

Model	χ^2	*df*	CFI	TLI	RMSEA	SRMS
Parent-reported problems and teacher-reported academic performance						
1A: Paths unconstrained	303.73	140	.95	.85	.085	.053
1B: Paths constrained across waves	371.96	215	.96	.91	.067	.060
1C: Paths constrained across waves and cohorts	455.26	311	.96	.94	.053	.078
1D: Different paths between childhood and adolescence	443.41	299	.96	.94	.054	.076
1E: Paths constrained across boys and girls	203.21	108	.97	.95	.046	.055
1F: Different paths between boys and girls	198.82	84	.96	.93	.058	.048
Teacher-reported problems and parent-reported academic performance						
2A: Paths unconstrained	356.97	140	.90	.69	.097	.068
2B: Paths constrained across waves	440.08	215	.90	.79	.080	.077
2C: Paths constrained across waves and cohorts	523.40	311	.90	.86	.065	.094
2D: Different paths between childhood and adolescence	511.14	299	.90	.86	.066	.093
2E: Paths constrained across boys and girls	226.40	108	.93	.90	.052	.064
2F: Different paths between boys and girls	204.66	84	.93	.87	.059	.055

Model Tests	χ^2	*df*	*p*	Favored model
1A versus 1B	78.28	75	.375	1B
1A versus 1C	168.07	171	.550	1C
1B versus 1C	89.83	96	.658	1C
1C versus 1D	12.72	12	.390	1C
1E versus 1F	8.95	24	.998	1E
2A versus 2B	97.88	75	.039	2A
2A versus 2C	197.59	171	.080	2C
2B versus 2C	100.83	96	.348	2C
2C versus 2D	14.21	12	.288	2C
2E versus 2F	26.44	24	.331	2E

Note: CFI = Comparative Fit Index, TLI = Tuckers-Lewis Index, RSMEA = Root Mean Square Error of Approximation, SRMS = Standardized Root Mean Square Residual

Regarding gender invariance, the χ^2 difference test of comparing models 1E and 1F was not significant, nor was the χ^2 difference test comparing models 2E and 2F. Thus, the models with constrained pathways between boys and girls fitted best, suggesting that there were no differences between boys and girls.

Figure 2 displays the final model that tests the cross-lagged paths of parent-reported internalizing and externalizing problems with teacher-reported academic performance. All coefficients are unstandardized estimates. We standardized all variables except gender before conducting the cross-lagged analyses, thus the coefficients are comparable across variables, waves, and cohort. The standardized coefficients (results not shown) are very similar to the unstandardized coefficients. The model demonstrates high significant

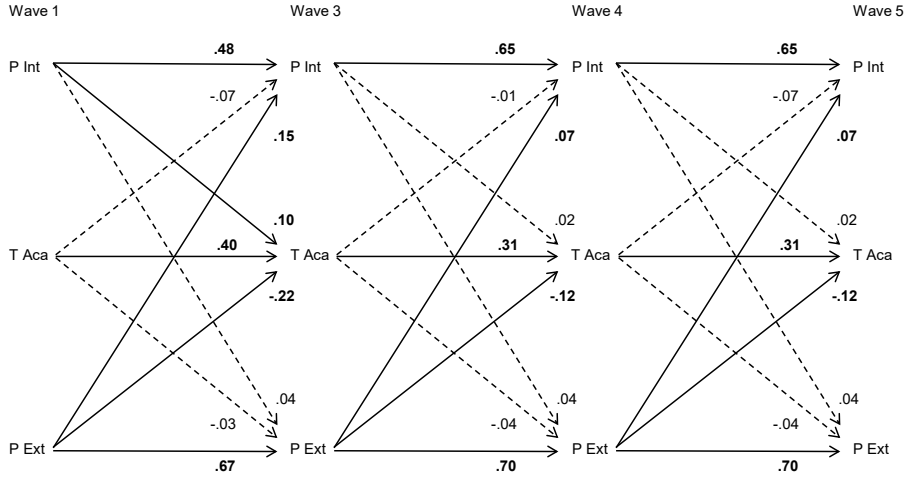

Figure 2. Cross-lagged model examining paths between parent-reported internalizing problems, parent-reported externalizing problems, and teacher-reported academic performance. Solid lines indicate significant paths (p<.05). P Int = parent-reported internalizing problems, P Ext = parent-reported externalizing problems, T Aca = teacher-reported academic performance

stability coefficients for internalizing (.48-.65) and externalizing problems (.67-.70) and somewhat lower stability paths for academic performance paths (.31-.40). Figure 2 also shows that the strongest crossed-lagged paths are from externalizing problems to academic performance (-.12--.22). There is only one significant path (.10) from internalizing problems at wave 1 to academic performance at wave 3. The model does not reveal reverse paths, neither from academic performance to internalizing problems nor from academic performance to externalizing problems. Regarding problem behavior, there are only significant paths from externalizing to internalizing problems and not from internalizing to externalizing problems. All models also account for concurrent associations (not shown), which are all significant.

The results of the model based on teacher-reported internalizing and externalizing problems and parent-reported academic performance are shown in figure 3. Although all paths in model 1C are also significant in model 2C, there are some notable differences between the two models. First, the stability paths of internalizing problems are lower than those in model 1C, whereas the stability paths of academic performance are higher than those in model 1C. Second, in model 1C none of the paths from academic performance to internalizing and externalizing problems are significant, whereas all corresponding paths in model 2C are significant with coefficients ranging from -.11 to -.12. Third, in addition to paths from externalizing to internalizing problems as in model 1C, there are negative paths (-.14 to -.16) from internalizing to externalizing problems. Thus higher scores of internalizing problems lead to lower scores of externalizing problems, which suggests

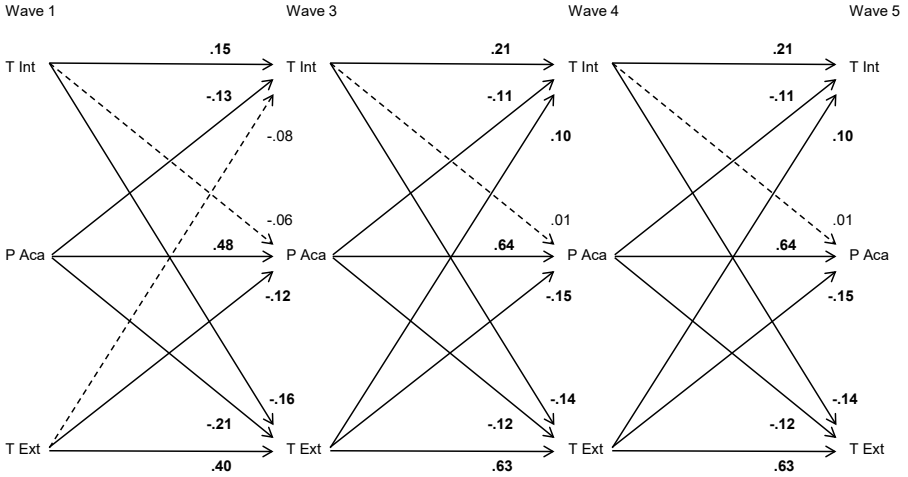

Figure 3. Cross-lagged model examining paths between teacher-reported internalizing problems, teacher-reported externalizing problems, and parent-reported academic performance. Solid lines indicate significant paths (p<.05). T Int = teacher-reported internalizing problems, T Ext = teacher-reported externalizing problems, P Aca = parent-reported academic performance

that internalizing problems protects against externalizing problems. Like in model 1C, all associations between concurrent variables are significant.

DISCUSSION

The current study tested two series of cross-lagged models. One series examined bidirectional paths between parent-reported internalizing and externalizing problems versus teacher-reported academic performance. The other series involved teacher-reported internalizing and externalizing problems versus parent-reported academic performance. The two final best-fitting models revealed marked similarities irrespective of the informants who reported on problem behavior or on academic performance. First, there were significant pathways from externalizing problems to subsequent academic performance throughout the study period, over and above within-time associations. This was consistent over-time and remained accounting for the covariates gender and parents' socioeconomic status in both final models. Second, pathways from internalizing problems to academic performance did not emerge in either of the final models.

However, there were some differences between the two final models as well. Paths from parent-reported academic performance to teacher-reported internalizing problems and to externalizing problems were observed, but these paths were not found when teachers reported on problem behavior and parents on academic performance. A further differ-

ence concerns the negative paths from internalizing to externalizing problems that were only observed for teacher reports. These observed pathways must be interpreted with caution given the lack of consistency across informant pair.

Unlike previous studies, we examined two series of models in which the two different informants on problem behavior and academic problems were interchanged. Some differences in findings from these series of models may be attributed to the fact that teachers were almost always different across waves of one individual, whereas the mother was in more than 85% of the cases the informant in adjacent waves. This difference between teacher and parent report is probably not the sole reason for the difference in results, because there were also clearly consistent findings observed in the two final models.

Our study covered a broader age range and longer follow-up interval than most previous studies, which enabled us to test whether bidirectional pathways between problem behavior and academic performance in childhood differed from pathways in adolescence. However, we did not observe any differences by age period in our study.

Bidirectional paths

The consistent finding in our study concerns the pathway between externalizing problems and subsequent academic performance. This has repeatedly been reported in studies also applying cross-lagged models to test the relation between problem behavior and academic performance. Our finding clearly supports the adjustment erosion hypothesis, which suggests that problem behavior weakens academic performance and raises vulnerability to problems in other areas. Behaviors such as impulsivity or hostility, which accompany externalizing problems, may interfere with children's functioning in school. Children with these problems more often experience negative responses from their teachers and peers, which creates an unfavorable learning environment leading to poor academic performance (Chen, et al., 2010; Moilanen, et al., 2010). The pathway from externalizing problems to academic performance is especially worrisome, because there is evidence that this pathway entails risks of adverse outcomes in adulthood such as crime (Jakobsen, Fergusson, & Horwood, 2012). Interventions should therefore attempt to break this pathway to circumvent problems later in life.

A second consistent finding concerns the absence of a pathway from internalizing problems to academic performance, which is in line with most previous studies (Burt & Roisman, 2010; Defoe, et al., 2013; Masten, et al., 2005; Moilanen, et al., 2010; Riglin, et al., 2013). This pathway emerged in some studies using cross-lagged models (Englund & Siebenbruner, 2012; Obradović, et al., 2010; Verboom, et al., 2014). However, most of these studies did not include externalizing problems in their cross-lagged models, which can have contributed to the presumed effect of internalizing problems. In line with this, the meta-analysis of Esch, et al. (2014) suggested that the association between internalizing disorders and educational attainment was explained by co-occurring disruptive be-

haviors. The study of Obradović, et al. (2010) most clearly demonstrated this effect. When externalizing problems at baseline were entered in the crossed-lagged model, the pathway from baseline internalizing problems to subsequent academic functioning disappeared. Prior research also demonstrated that poor social rather than academic functioning predicted internalizing problems (Masten, et al., 2005). Indeed, in the association between problem behavior and social competence, internalizing problems were more typically the outcome than a predictor (Burt & Roisman, 2010; Obradović, et al., 2010). In contrast, externalizing problems typically precede poor academic performance (Burt & Roisman, 2010; Chen, et al., 2010).

Our results only partially confirmed the cascading pathways from externalizing problems to subsequent academic performance and from academic performance to internalizing problems as found in previous studies (Burt & Roisman, 2010; Masten, et al., 2005; Moilanen, et al., 2010; van Lier, et al., 2012). In the present study, we found that only if studied by teacher report, but not if studied by parent report, externalizing problems ignited a cascade of poor academic function. A possible explanation for this discrepancy of association patterns obtained by using different informants could be that teachers tend to rate problem behavior of children with low grades more negatively than parents do (Loveland, Lounsbury, Welsh, & Buboltz, 2007). Because of this reporting tendency, the model with teacher-reported problem behavior may have revealed more pathways from academic performance to internalizing problems than the model with parent-reported problem behavior. As we found only partial support for the pathway from academic performance to internalizing problems, our results arguably corroborate the academic incompetence hypothesis, which suggests that poor academic functioning leads to problem behavior, less convincingly. However, we certainly do not rule out that children with low academic performance encounter negative feedback from teachers and parents, which in turn may lead to negative mood (Moilanen, et al., 2010).

A further finding is that internalizing problems are negatively associated with subsequent externalizing problems, which is in line with results from previous studies (Englund & Siebenbruner, 2012; Masten, et al., 2005). Thus, internalizing problems can "protect" against externalizing problems, which is supported by the finding that inhibition and anxiety protect against delinquency (Defoe, et al., 2013; Kerr, Tremblay, Pagani, & Vitaro, 1997). Thus, internalizing problems, an important disadvantageous outcome and an important risk factor for adverse outcomes such as suicide, is probably negatively related to other unfavorable outcomes (Masten, et al., 2005). Anxious children may fare better in school as a result of their conscientiousness and discipline that are associated with anxiety. Yet, externalizing problems clearly preceded internalizing problems in the present study. Aggressive and hostile children may interact with peers in a damaging way leading to their rejection. As a consequence, these children are feeling worthless and may develop depressive symptoms (Moilanen, et al., 2010; van Lier, et al., 2012).

Our sample was selected from the general population. Therefore, only a small number of children in the sample exhibited elevated levels of internalizing and externalizing problems. About 13% of the children had scores above the clinical cut-off on parent-reported internalizing problems and about 15% scored above the clinical cut-off on externalizing problems. These low numbers may have an effect on the concurrent and longitudinal associations between problem behavior and academic performance. Possibly, the associations are stronger in clinical samples than in population samples. However, clinical samples are often not representative regarding gender, age, socio-economic background, ethnicity, and other confounders. Thus, the associations observed in clinical sample are often biased (Angold, Costello, & Erkanli, 1999).

Age and gender differences

We did not find different bidirectional pathways between childhood and adolescence. Although the prevalence of disorders is higher in adolescence than in childhood (Offord, et al., 1987) and cognitive task may be more challenging in adolescence, the impact of pathways from internalizing and externalizing problems to academic performance or vice versa do not differ between the two developmental periods. If the detrimental effects of externalizing problems on academic performance are observed throughout the age span from 6-18, intervention programs must account for these effects. To intervene at an early age may be most beneficial. Because only few studies tested age differences of the bidirectional pathways and reveled contradicting findings, more research is needed.

We did not observe gender differences in the bidirectional pathways between problem behavior and academic problems. Our findings are in line with most previous studies that tested gender differences in cross-lagged models. The two studies that reported differences between boys and girls only included internalizing problems in their models (Obradović, et al., 2010; Verboom, et al., 2014). Possibly, not accounting for externalizing problems contributed to the observed gender differences.

Implications

The salient finding that externalizing problems adversely affects subsequent academic performance calls for intervention programs addressing these problems (see for an overview Barnes, Smith, & Miller, 2014; Wilson & Lipsey, 2007). Albeit, less clearly, our results also showed pathways from academic performance to internalizing and externalizing problems, indicating that academic performance may also be a worthwhile target for interventions that may lower the risk of problem behaviors (see Campbell, et al., 2002; Reynolds, et al., 2007). The finding that the adverse effect of externalizing problems on academic performance is observed across 6 to 18 years implies that effective interventions should target children. The sooner an intervention will lower externalizing problems the more it will impede adverse effects of externalizing problems. A next step for research is to

determine mediators influencing the pathway from externalizing problems to academic functioning. Victimization, self-esteem, social competence, peer influences, and parenting (Masten, et al., 2005; van Lier, et al., 2012) are likely candidates that may underlie the pathways from externalizing problems to academic performance demonstrated in the present study.

Strengths and limitations

A strength of this study is the consistent set of instruments that were used to assess problem behavior and academic performance. Identical instruments were used for assessments across waves and ages. Although not identical, the CBCL and TRF are instruments for parents and teachers respectively that overlap greatly in content and have identical item formats. Both problem behavior and academic performance were rated by different informants. The current study comprises an age span of 12 years. The multiple age cohorts from 6 to 10 years and the statistical analysis accounting for these cohorts enabled to examine bidirectional paths from 6 to 18 years covering childhood as well as adolescence. Most previous studies comprise shorter intervals, up to 5 years, and covering only childhood or only adolescence.

We must also discuss some limitations. Our academic performance measure was based on ratings by parents and teachers. However, parents may be not the best reporters of their children's academic performance, because it is not directly observed by them. On the other hand, teachers may rate children's academic performance less favorable because of their disrupting behavior. Using independent standardized test results may resolve these two problems.

We included only a few covariates in the study and thus cannot demonstrate whether other shared risk factors confound the associations of internalizing problems, externalizing problems and academic performance (Moilanen, et al., 2010). Also, we did not add mediation analyses by parent or child characteristics such as parenting style or child temperament. However, we included gender and parents' socio-economic status as control variables in line with many previous studies. Other studies also controlled for variables such as cognitive ability, parenting, neighborhood adversity, maternal sensitivity, although none of these affected the effect estimates of the overall cross-lagged paths substantially in previous studies.

Future directions

In light of the current study and prior research several issues should also be addressed in future studies. The majority of previous studies examining bidirectional paths between problem behavior and academic performance comprised limited age ranges throughout the interval period. Only a few studies with repeated assessments followed children over longer intervals that crossed developmental periods (i.e., from childhood to adolescence

or to adulthood). More studies are needed with longer follow-up intervals beginning at an early age. Such studies will provide more insight into when interventions may be most successful.

It is also important to study how the paths between problem behavior and academic function are mediated by other domains of functioning. Previous studies have for example, focused on social competence, victimization, and self-esteem as mediators. However, not only more mediators must be addressed, the role of potential mediators must be evaluated more rigorously using, for example, using multiple informants in contrasting the models. We showed the value of using different combinations of the same informants in a set of analyses, where both informants' reports were used but either for the outcome or for the determinant.

Conclusion

Externalizing problems preceded academic problems, whereas such a prospective association did not emerge for internalizing problems. Some evidence for the reversed association was also found: poor academic performance predicted externalizing and internalizing problems. This direction of association was less clear as it was not independent of the rater of the academic performance. However, teacher-rated poor academic performance predicted increasing levels of internalizing and externalizing problems over a long follow-up time. All findings were observed using different raters for determinant and outcome and taking pre-existing problems into account.

REFERENCES

Achenbach, T. M. (2009). *The Achenbach System of Empirically Based Assessment (ASEBA): Development, findings, theory, and applications*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: implications of cross-informant correlations for situational specificity. *Psychological Bulletin, 101*(2), 213-232.

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Angold, A., Costello, E. J., & Erkanli, A. (1999). Comorbidity. *Journal of Child Psychology and Psychiatry, 40*(1), 57-87.

Barnes, T. N., Smith, S. W., & Miller, M. D. (2014). School-based cognitive-behavioral interventions in the treatment of aggression in the United States: A meta-analysis. *Aggression and Violent Behavior, 19*(4), 311-321.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*(3), 588-606.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research, 21*(2), 230-258.

Burt, K. B., & Roisman, G. I. (2010). Competence and psychopathology: Cascade effects in the NICHD Study of Early Child Care and Youth Development. *Development and Psychopathology, 22*(3), 557-567.

Campbell, F. A., Ramey, C. T., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian Project. *Applied Developmental Science, 6*(1), 42-57.

Chen, X., Huang, X., Chang, L., Wang, L., & Li, D. (2010). Aggression, social competence, and academic achievement in Chinese children: A 5-year longitudinal study. *Development and Psychopathology, 22*(3), 583-592.

Chi-square. (n.d.). Chi-square difference testing using the Satorra-Bentler scaled chi-square. Retrieved July 17, 2015, from http://statmodel.com/chidiff.shtml

Costello, E. J., Egger, H., & Angold, A. (2005). 10-Year research update review: The epidemiology of child and adolescent psychiatric disorders: I. Methods and public health burden. *Journal of the American Academy of Child & Adolescent Psychiatry, 44*(10), 972-986.

Costello, E. J., & Maughan, B. (2015). Annual research review: Optimal outcomes of child and adolescent mental illness. *Journal of Child Psychology and Psychiatry, 56*(3), 324-341.

Defoe, I. N., Farrington, D. P., & Loeber, R. (2013). Disentangling the relationship between delinquency and hyperactivity, low achievement, depression, and low socioeconomic status: Analysis of repeated longitudinal data. *Journal of Criminal Justice, 41*(2), 100-107.

Englund, M. M., & Siebenbruner, J. (2012). Developmental pathways linking externalizing symptoms, internalizing symptoms, and academic competence to adolescent substance use. *Journal of Adolescence, 35*(5), 1123-1140.

Esch, P., Bocquet, V., Pull, C., Couffignal, S., Lehnert, T., Graas, M., et al. (2014). The downward spiral of mental disorders and educational attainment: a systematic review on early school leaving. *BMC Psychiatry, 14*, 237.

Jakobsen, I. S., Fergusson, D., & Horwood, J. L. (2012). Early conduct problems, school achievement and later crime: Findings from a 30-year longitudinal study. *New Zealand Journal of Educational Studies, 47*(1), 123-135.

Jones, P. B. (2013). Adult mental health disorders and their age at onset. *British Journal of Psychiatry, 202*, s5-s10.

Kerr, M., Tremblay, R. E., Pagani, L., & Vitaro, F. (1997). Boys' behavioral inhibition and the risk of later delinquency. *Archives of General Psychiatry, 54*(9), 809-816.

Krueger, R. F., & Markon, K. E. (2006). Reinterpreting comorbidity: A model-based approach to understanding and classifying psychopathology. *Annual Review of Clinical Psychology, 2*(1), 111-133.

Leach, L. S., & Butterworth, P. (2012). The effect of early onset common mental disorders on educational attainment in Australia. *Psychiatry Research, 199*(1), 51-57.

Lee, J. (2013). A cross-lagged longitudinal study of relations between academic achievement and Korean adolescent delinquency. *Health Education Journal, 72*(5), 555-563.

Loveland, J. M., Lounsbury, J. W., Welsh, D., & Buboltz, W. C. (2007). The validity of physical aggression in predicting adolescent academic performance. *British Journal of Educational Psychology, 77*(1), 167-176.

Masten, A. S., Desjardins, C. D., McCormick, C. M., Kuo, S. I. C., & Long, J. D. (2010). The significance of childhood competence and problems for adult success in work: A developmental cascade analysis. *Development and Psychopathology, 22*(3), 679-694.

Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradovic, J., Riley, J. R., et al. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*(5), 733-746.

McLeod, J. D., & Fettes, D. L. (2007). Trajectories of failure: The educational careers of children with mental health problems. *American Journal of Sociology, 113*(3), 653-701.

McLeod, J. D., & Kaiser, K. (2004). Childhood emotional and behavioral problems and educational attainment. *American Sociological Review, 69*(5), 636-658.

Metsäpelto, R.-L., Pakarinen, E., Kiuru, N., Poikkeus, A.-M., Lerkkanen, M.-K., & Nurmi, J.-E. (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.

Moilanen, K. L., Shaw, D. S., & Maxwell, K. L. (2010). Developmental cascades: Externalizing, internalizing, and academic competence from middle childhood to early adolescence. *Development and Psychopathology, 22*(3), 635-653.

Muthén, L. K., & Muthén, B. O. (1998-2012). *Mplus User's Guide. Seventh Edition*. Los Angeles, CA: Muthén & Muthén.

Needham, B. L. (2009). Adolescent depressive symptomatology and young adult educational attainment: An examination of gender differences. *Journal of Adolescent Health, 45*(2), 179-186.

Obradović, J., Burt, K. B., & Masten, A. S. (2010). Testing a dual cascade model linking competence and symptoms over 20 years from childhood to adulthood. *Journal of Clinical Child & Adolescent Psychology, 39*(1), 90-102.

Offord, D. R., Boyle, M. H., Szatmari, P., Rae-Grant, N. I., Links, P. S., Cadman, D. T., et al. (1987). Ontario Child Health Study. II. Six-month prevalence of disorder and rates of service utilization. *Archives of General Psychiatry, 44*(9), 832-836.

Patalay, P., Deighton, J., Fonagy, P., & Wolpert, M. (2015). The relationship between internalising symptom development and academic attainment in early adolescence. *PLoS ONE, 10*(1), e0116821.

Polanczyk, G. V., Salum, G. A., Sugaya, L. S., Caye, A., & Rohde, L. A. (2015). Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry, 56*(3), 345-365.

Reynolds, A. J., Temple, J. A., Ou, S., & et al. (2007). Effects of a school-based, early childhood intervention on adult health and well-being: A 19-year follow-up of low-income families. *Archives of Pediatrics & Adolescent Medicine, 161*(8), 730-739.

Riglin, L., Frederickson, N., Shelton, K. H., & Rice, F. (2013). A longitudinal study of psychological functioning and academic attainment at the transition to secondary school. *Journal of Adolescence, 36*(3), 507-517.

Riglin, L., Petrides, K. V., Frederickson, N., & Rice, F. (2014). The relationship between emotional problems and subsequent school attainment: A meta-analysis. *Journal of Adolescence, 37*(4), 335-346.

Ringoot, A. P., Tiemeier, H., Jaddoe, V. W. V., So, P., Hofman, A., Verhulst, F. C., et al. (2015). Parental depression and child well-being: young children's self-reports helped addressing biases in parent reports. *Journal of Clinical Epidemiology, 68*(8), 928-938.

Selig, J. P., & Little, T. D. (2012). Autoregressive and cross-lagged panel analysis for longitudinal data. In B. Laursen, T. D. Little & N. A. Card (Eds.), *Handbook of development research methods* (pp. 265-278). New York: The Guilford Press.

Vaillancourt, T., Brittain, H., McDougall, P., & Duku, E. (2013). Longitudinal links between childhood peer victimization, internalizing and externalizing problems, and academic functioning: Developmental cascades. *Journal of Abnormal Child Psychology, 41*(8), 1203-1215.

van Lier, P. A. C., Vitaro, F., Barker, E. D., Brendgen, M., Tremblay, R. E., & Boivin, M. (2012). Peer victimization, poor academic achievement, and the link between childhood externalizing and internalizing problems. *Child Development, 83*(5), 1775-1788.

Veldman, K., Bültmann, U., Stewart, R. E., Ormel, J., Verhulst, F. C., & Reijneveld, S. A. (2014). Mental health problems and educational attainment in adolescence: 9-Year follow-up of the TRAILS study. *PLoS ONE, 9*(7), e101751.

Verboom, C. E., Sijtsema, J. J., Verhulst, F. C., Penninx, B. W., & Ormel, J. (2014). Longitudinal associations between depressive problems, academic performance, and social functioning in adolescent boys and girls. *Developmental Psychology, 50*(1), 247-257.

Verhulst, F. C., Akkerhuis, G. W., & Althaus, M. (1985). Mental health in Dutch children: (I). A cross-cultural comparison. *Acta Psychiatrica Scandinavica Supplement, 323*, 1-108.

Verhulst, F. C., Van der Ende, J., & Koot, H. M. (1996). *Handleiding voor de CBCL/4-18.* Rotterdam: Afdeling kinder- en jeugdpsychiatrie, Erasmus Universiteit/AZR-Sophia.

Westerlaak, J. M., Kropman, J. A., & Collaris, J. W. M. (1975). *Beroepenklapper*. Nijmegen: Instituut voor Toegepaste Sociologie.

Wilson, S. J., & Lipsey, M. W. (2007). School-based interventions for aggressive and disruptive behavior: Update of a meta-analysis. *American Journal of Preventive Medicine, 33*(2, Supplement), S130-S143.

Zahn-Waxler, C. (1993). Warriors and worriers: Gender and psychopathology. *Development and Psychopathology, 5*(1-2), 79-89.

Zimmermann, F., Schutte, K., Taskinen, P., & Koller, O. (2013). Reciprocal effects between adolescent externalizing problems and measures of achievement. *Journal of Educational Psychology, 105*(3), 747-761.