

THE DEVELOPMENT OF INTERNALIZING AND EXTERNALIZING PROBLEMS FROM
A CO-DEVELOPMENT PERSPECTIVE AND THEIR ASSOCIATIONS WITH EARLY
CHILDHOOD CHARACTERISTICS AND LONGITUDINAL SCHOOL ADJUSTMENTS

A Dissertation

by

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Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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December 2020

Major Subject: Educational Psychology

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ABSTRACT

As internalizing and externalizing problems often co-occur, this dissertation utilized a longitudinal dataset of 784 at-risk children (predominantly from low-income families and academically at-risk; 52.6% male) followed yearly from grade 1 to grade 12 to: (a) explore the heterogeneity in the co-development patterns of internalizing and externalizing problems by using both variable and person-centered approach, and (b) investigate early childhood antecedents that might explain differentiated co-developmental patterns, and (c) explore the patterns of co-occurring problems and their long-term associations with teacher-child relationship quality and academic (math and reading) performance were assessed.

In study 1, a bi-factor model, consisting of a general psychopathology factor and two specific factors of domain-specific internalizing and externalizing factor, fitted best across four developmental periods (early childhood, late childhood, early adolescence, late adolescence) and across parent and teacher report. The evidence from this variable-centered approach indicated that co-occurrence is the rule, other than exception. From person-centered approach, results revealed four distinct co-development trajectories of internalizing and externalizing problems including chronic co-occurring, moderate co-occurring, pure-externalizing, and low-risk groups.

In study 2, the antecedents consisted of individual (i.e., ego-resilient personality, intelligence, language ability, gender, and ethnicity) and contextual factors (i.e., maternal support and responsiveness, family socioeconomic adversity, teacher-child relationship conflict, and peer rejection). While children who belonged to any of the three higher risk groups (identified from study 1) exhibited more adverse early childhood antecedents compared with the low-risk group, the chronic co-occurring group displayed the most severe profiles of early childhood antecedents

compared to the moderate co-occurring and the pure-externalizing groups. Common antecedents for the three higher risk groups were lower ego-resilient personality, higher teacher-child relationship conflict, being male and being African-American. Low language ability and peer rejection were identified as unique antecedents for the chronic co-occurring group.

In study 3, children with chronic co-occurring internalizing and externalizing problems exhibited more sustained teacher-child conflict, lower teacher-child warmth, and lower math and reading performance. Children with pure externalizing and moderate co-occurring problems were also at risk for scholastic difficulties, but to a lesser magnitude than children with chronic co-occurring problems. Compared to children in the low risk group, those in all three risk groups exhibited patterns of scholastic maladjustment that were either sustained or worsened after the transition to middle school.

DEDICATION

I would like to thank my committee chair, Dr. Woltering, committee co-chair, Dr. Liew, and my committee members, Dr. Ettekal, and Dr. Schmeichel, for their guidance and support throughout the course of this research.

Thanks also go to my friends and colleagues and the department faculty and staff for making my time at Texas A&M University a great experience.

Finally, thanks to my mother and father for their encouragement and my husband for his patience and love.

ACKNOWLEDGMENTS

The completion of my dissertation could not have been possible without the tremendous help from so many people. First but not least, I want to express my appreciation to my chair, Dr. Steven Woltering. I started working as a research assistant in Dr. Woltering's Neurobiological Lab for Learning and Development (NLD) in 2014. During these past six years, I received tremendous support and encouragement from him, and I felt lucky to be his student. To me, NLD is my home, and here, we shout out bright ideas, engage in heated discussions, and share exciting life stories. Dr. Woltering is there for me during happy moments, but he is also standing next to me in tough times. I still remembered the moments and efforts he tried to pull me up during the hard moments. No matter where I go after graduate school, I will never forget the stories that happened in our NLD since I know this is one of my best life experiences.

I also want to express the deserved acknowledgment of my co-chair Dr. Jeffrey Liew. To me, Dr. Liew is an inspiring mentor, and one thing he told me changed my mindset. He told me I can be anyone I want to be! I always enjoyed conversations with him, and every time after meeting with Dr. Liew, I felt refreshed and energized since he is open to share his perspectives and let students feel being respected and valued. Dr. Liew is also thoughtful in sharing great opportunities with me. I feel incredibly honored to have Dr. Liew as my co-chair.

In addition to my thanks to Dr. Woltering and Dr. Liew, I want to express my gratitude and acknowledgment to my committee member, Dr. Idean Ettekal. I worked under Dr. Ettekal's supervision from 2018 to 2019 academic year, and I truly admired his mentoring styles. He always carefully listens to my perspectives, incorporating his professional experience, and

enlighten my mind for the next steps. I admire Dr. Ettekal since he is always detailed oriented, and I learned so much from him on how to step-by-step deliver solid research work.

I also want to especially thank Dr. Marike Deutz since she impacts me in many ways. During the year of 2017-2017, Marike and I worked together on papers and projects, and I was amazed by how sharp and professional she was. I started to see her as my role model because she is so ahead of me and also willing to share her stories and experiences with me. Since I have her as my role model at the early stage of my graduate school journey, I decided that I want to go into academia, and Marike is the person who helps me confirmed my passion.

To all my closest friends and lab mates, my life would not be the same without you all. I sincerely cherished our time spent together and let our friendship remain forever.

From the bottom of my heart, I want to thank my parents. I deeply understand how much effort my parent had for supporting my dream. As the only child, I know how much they have missed me during the past eight years since I could not physically be around. I am fortunate that my parents value education so that I had the chance to study abroad and continue pursuing my dreams. I appreciate the best wisdom my parents have passed on me to be resilient and independent. I cannot even near the finishing line without their love and support.

Additionally, I would like to thank my husband, Dr. Tingcheng Wu. He is not only my best friend but also the love of my life. My husband is always standing next to me for ups and downs, and he is the one I truly trust and admire. We came to the United States one year apart and started our Ph.D. journey together at Texas A&M University; I feel fortunate that my husband and I are sharing similar trajectories so that we can deeply understand and support each other. My husband provided me with autonomy and protection, and without him, I could not achieve what I have accomplished today.

Finally, I want to thank Dr. Jan Hughes for providing our team access to the dataset, the research staff responsible for data collection, and the families who participated in this study.

CONTRIBUTORS AND FUNDING SOURCES

Contributors

This work was supervised by a dissertation committee consisting of Professors Steven Woltering (chair), Jeffrey Liew (co-chair), and Idean Ettekal (committee member) of the Department of Educational Psychology, and Brandon J. Schmeichel of the Department of Psychology.

The data analyzed for Study 1 was supervised by Professor Wen Luo of the Department of Educational Psychology and Professor Marike Deutz of the Department of Psychology, Education & Child Studies at Erasmus University Rotterdam. The analyses depicted in Study 2 and 3 were supervised by Professor Idean Ettekal of the Department of Educational Psychology and were published in 2020.

All other work conducted for the dissertation was completed by the student independently, with various levels of supervision along the side.

Funding Sources

Graduate study was supported by a Strategic Research fellowship from Texas A&M University.

This work was also made possible in part by National Institute of Child Health and Human Development (NICHD) under Grant Number R01 HD39367. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
DEDICATION	iv
ACKNOWLEDGMENTS	v
CONTRIBUTORS AND FUNDING SOURCES	viii
TABLE OF CONTENTS	ix
LIST OF FIGURES	xiii
LIST OF TABLES	xiv
1. INTRODUCTION	1
1.1. Definition, Scope, and Severity of Internalizing Problems and Externalizing Problems	1
1.2. Rationale for Examining Co-occurring Internalizing and Externalizing Problems.....	2
1.3. The Relevance of Examining the Development of These Problem Behaviors.....	4
1.4. Development of Externalizing Problems	5
1.5. Development of Internalizing Problems	6
1.6. Statistical Tool for Analyzing Co-occurring Psychopathology Pattern.....	7
1.7. Individual and Contextual Antecedents	8
1.7.1. Early Individual Antecedents: Temperament, Language Ability, Intelligence, Gender, and Ethnicity	8
1.7.2. Early Contextual Antecedents: Parent, Teacher, and Peer Relationships.....	10
1.7.3. Academic Performance	12
1.8. Proposed Research Questions for the Dissertation	13
1.8.1. Specific Aim # 1: Explore the Co-development Mechanism of Internalizing and Externalizing Problems from Both Variable and Person-centered Approach	13
1.8.2. Specific Aim # 2: Investigate Predictive Effects of Early Childhood Predictor(s) on Co-developmental Mechanism	14
1.8.3. Specific Aim # 3: Examine Longitudinal Outcome(s) Are Associated with the Co- developmental Mechanism	15
1.9. Impact	15
1.10. References.....	15
2. CONCEPTUALIZING CO-OCCURRING INTERNALIZING AND EXTERNALIZING PROBLEMS FROM BOTH VARIABLE AND PERSON -CENTERED APPROACH	30

2.1. Introduction.....	30
2.1.1. Conceptualization of Co-occurring Problems from Variable-centered Approach.....	31
2.1.2. Conceptualization of Co-occurring Problems from Person-centered Approach	33
2.2. The Current Study.....	35
2.3. Method.....	35
2.3.1. Participants.....	35
2.3.2. Procedure	36
2.4. Measures	37
2.4.1. Externalizing and Internalizing Problems.....	37
2.5. Analysis Plan	39
2.5.1. Variable-centered Approach	39
2.5.2. Person-centered Approach	41
2.5.3. Missing Data	42
2.6. Results.....	44
2.6.1. Variable-centered Approach	44
2.6.2. Person-centered Approach	51
2.7. Discussion.....	53
2.7.1. Variable-centered Approach	53
2.7.2. Person-centered Approach	54
2.7.3. Limitations	57
2.7.4. Conclusion	58
2.8. References.....	58

3. TRAJECTORIES OF PURE AND CO-OCCURRING INTERNALIZING AND EXTERNALIZING PROBLEMS FROM EARLY CHILDHOOD TO ADOLESCENCE: ASSOCIATIONS WITH EARLY CHILDHOOD INDIVIDUAL AND CONTEXTUAL ANTECEDENTS 68

3.1. Introduction.....	68
3.1.1. Co-occurring Development of Internalizing and Externalizing Problems.....	70
3.1.2. Early Childhood Individual and Contextual Antecedents.....	71
3.1.3. Study Aims and Hypotheses	73
3.2. Method.....	75
3.2.1. Participants.....	75
3.2.2. Procedure	76
3.3. Measures	77
3.3.1. Outcomes	77
3.3.2. Early Childhood Individual Antecedents.....	79
3.3.3. Early Childhood Contextual Antecedents.....	80
3.4. Data Analysis Plan.....	81
3.5. Results.....	82
3.5.1. Preliminary Analyses	82
3.5.2. Co-Occurring Development of Internalizing and Externalizing Problems.....	84
3.5.3. Examining Antecedents of the Trajectory Classes	87
3.5.4. Co-Occurring Development of Internalizing and Externalizing Problems.....	90

3.5.5. Early Childhood Individual and Contextual Antecedents.....	91
3.5.6. Early Childhood Common and Unique Antecedents.....	92
3.5.7. Implications.....	95
3.5.8. Strengths, Limitations, Future Directions.....	96
3.6. Conclusion.....	99
3.7. References.....	100
4. CO-OCCURRING TRAJECTORIES OF INTERNALIZING AND EXTERNALIZING PROBLEMS FROM GRADES 1 TO 12: LONGITUDINAL ASSOCIATIONS WITH TEACHER-CHILD RELATIONSHIP QUALITY AND ACADEMIC PERFORMANCE.....	109
4.1. Introduction.....	109
4.1.1. Development of Internalizing and Externalizing Problems.....	112
4.1.2. Teacher-Child Relationship Quality.....	113
4.1.3. Academic Performance.....	117
4.1.4. The Current Study.....	120
4.2. Method.....	120
4.2.1. Participants.....	120
4.2.2. Procedure.....	121
4.3. Measures.....	124
4.3.1. Externalizing and Internalizing Problems.....	124
4.3.2. Teacher-child Relationship.....	126
4.3.3. Academic Performance.....	126
4.3.4. Covariates.....	128
4.4. Analysis Plan.....	128
4.5. Results.....	130
4.5.1. Missing Data Analyses.....	130
4.5.2. Descriptive Statistics and Bivariate Correlations.....	131
4.5.3. Co-occurring Internalizing and Externalizing Trajectories.....	133
4.5.4. Associations Between the Co-Occurring Problem Behavior Groups and Their Academic Performance and Teacher-Child Relationship Trajectories.....	134
4.6. Discussion.....	148
4.6.1. Teacher-child Relationship Quality.....	149
4.6.2. Academic Performance.....	153
4.6.3. Limitations and Future Directions.....	155
4.6.4. Implications for Interventions.....	157
4.7. Conclusion.....	158
4.8. References.....	158
5. CONCLUSIONS.....	178
5.1. Aim 1: Conceptualization and Operationalization of the Co-occurring Internalizing and Externalizing Problems from Both Variable and Person-centered Approach.....	178
5.2. Aim 2: The Predictive Effect of Early Childhood Factors on the Development of Co- occurring Problems.....	179

5.3. Aim 3: Longitudinal Associations between School Adjustments with Co-occurring Problems	180
APPENDIX A.....	181

LIST OF FIGURES

	Page
Figure 2-1. The Bi-factor Model for Representing Domain-specific Internalizing and Externalizing Factors and the General Psychopathology Factor.	40
Figure 2-2. The One-factor and Two-factor Model.	41
Figure 2-3. Joint Trajectory Model Examining the Co-development of Externalizing and Internalizing Problems from Grades 1 to 12	52
Figure 4-1. Children’s Predicted Trajectories for Teacher-child Warmth and Conflict, Reading Performance, and Math Performance for Each of the Four Co-development Trajectories of Internalizing and Externalizing Problems.	147

LIST OF TABLES

	Page
Table 2-1. Fit Indices of One-Factor, Two-factor, and Bi-factor Models for the Parent and Teacher -reported SDQ Data across Early Childhood to Late Adolescence.....	45
Table 2-2. Measurement Invariance of the Bi-factor Model with Teacher and Parent-Reported SDQ Data	47
Table 2-3. Fully Standardized Item Loadings from Bi-factor Models of Parent and Teacher SDQs	49
Table 3-1. Sample Characteristics	78
Table 3-2. Model Fit Indices and Criteria for the Joint Trajectory One-Through Six-Class Models.....	86
Table 3-3. Multinomial Logistic Regression Analyses Comparing the Four Co-Development Trajectories in Terms of Early Childhood Antecedents (N =784)	89
Table 4-1. Descriptive Statistics for Teachers in Each Grade	123
Table 4-2. Descriptive Statistics (Range, Observed Means, and Standard Deviations) and Scale Reliabilities for Internalizing and Externalizing Problems, Teacher-child Warmth and Conflict, and Reading and Math Academic Performance	132
Table 4-3. Fit Indices of Models Examining the Developmental Trajectories of Internalizing and Externalizing Problems from Grades 1 to 12	136
Table 4-4. Estimates for Models Examining Children’s Teacher-child Relationship Quality and Academic Performance Trajectories by Four Differentiated Co-development Trajectories of Internalizing and Externalizing Problems (Using Low-risk Class as Reference)	137
Table 4-5. Estimates for Models Examining Children’s Teacher-child Relationship Quality and Academic Performance Trajectories by Four Differentiated Co-development Trajectories of Internalizing and Externalizing Problems (Using Chronic Class as Reference)	139

1. INTRODUCTION

The overall aim of this dissertation is to increase knowledge of co-occurring patterns of internalizing and externalizing problems by focusing on how to conceptualize and measure the patterns from both variable and person-centered approach, and also understand the associated antecedents and longitudinal outcomes. This dissertation strives to advance theory formation on co-occurring psychopathology patterns in childhood and adolescence by examining in-depth their conceptualization, operationalization, stability and change, continuity and discontinuity, associated/correlated antecedents, and outcomes. This dissertation focuses on three main research questions: (1) how to conceptualize and measure co-occurred internalizing and externalizing problems? (2) What are early childhood antecedents correlates with the co-occurred internalizing and externalizing problems? (3) What longitudinal outcomes are associated with co-occurred internalizing and externalizing problems? A detailed literature review was conducted and provided in the following sections in service of the three above-mentioned research questions.

1.1. Definition, Scope, and Severity of Internalizing Problems and Externalizing Problems

Psychopathology in children can be divided into two broad categories, namely externalization and internalization (APA, 2013). Aligning with the DSM-5 standards, the *internalizing* group reflect prominent symptoms as social withdrawal, anxiety, depression, and psychosomatic reactions; while the *externalizing* group involved delinquency, aggressive behaviors, attention problems, and substance use symptoms (Achenbach & Edelbrock; 1978; Kotov et al., 2017; Kessler et al., 2011; Krueger & Markon, 2011). The development of internalizing and externalizing problems has frequently been associated with severe negative

outcomes later in life such as elevated disciplinary problems, antisocial involvement, peer problems, victimization experiences, less prosocial tendencies, and increased academic deficits (Fanti & Henrich, 2010; Masten et al., 2005; Deighton et al., 2017; Weeks et al., 2016).

In general, the prevalence of psychopathology ranged from 9.5% (Ford, Goodman, & Meltzer, 2003; N=10,438) to 26.4% (Keenan, Shaw, Walsh, Delliquadri, & Giovannelli, 1997) in large population-based and clinical prevalence studies focused on preschoolers and older children. Specifically, Carter et al. (2010) focused on a sample of 442 early elementary children and reported that approximately one in five children met the criteria for a psychiatric disorder(s) with impairment. Moreover, Costello et al. (2003) reported on a sample of 1,420 older children and indicated a prevalence rate of 19.5% for 9-to 10-year-olds, and a lower rate of 8.3% for 11-to 12-year-olds for any diagnosis. According to the National Comorbidity Survey, among the 10,123 adolescents aged 13 to 18 years in the continental United States, 46.2% of the sample reported experiencing any form of internalizing problems (i.e., 14.3% mood problems; and 31.9% anxiety); 32.7% reported on the externalizing problems (i.e., 8.7% attention problems; 12.6% oppositional defiant disorder, and 11.4% substance use); and roughly half of the total sample (49.5%) was affected by at least one class of problems (Merikangas et al., 2010).

1.2. Rationale for Examining Co-occurring Internalizing and Externalizing Problems

Researchers have recently argued that the symptoms of internalizing and externalizing problems are continuous rather than categorical and that overlap between the symptoms (e.g., co-occurring symptoms) is the rule rather than the exception (Caspi & Moffitt, 2018; Achenbach, Ivanova, Rescorla, Turner, & Althoff, 2016). Indeed, significant correlations have consistently been documented between internalizing and externalizing problems in childhood (Gilliom & Shaw, 2004; McConaughy & Skiba, 1993) and adolescence (Burcusa, Iacono, & McGue, 2003;

Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). The Research Domain Criteria (RDoC) framework promoted by the National Institute of Health (NIH) highlighted the focus of co-occurring problems for future research (Krueger & DeYoung, 2016). Moreover, co-occurring problems have also been associated with unique outcomes and etiologies: children and adolescents who demonstrated co-occurring problems often experience more mental and health problems, exhibit escalated behavioral and/or psychosocial maladjustments, suffer from greater functional interference, and exhibit low academic performance compared to children and adolescents having externalizing or internalizing problems alone (Newman, Moffitt, Caspi, & Silva, 1998; Oland & Shaw, 2005).

Models such as the general psychopathology (Caspi et al., 2014; Caspi & Moffitt, 2018), the directional models (Lee & Bukowski, 2012; Capaldi & Stoolmiller, 1999; Patterson & Stoolmiller, 1991), the anxiety model of aggression (Granic, 2014; Woltering & Lewis, 2013), and reciprocal models (Keiley, Bates, Dodge, & Pettit, 2000) all suggest the importance of considering internalizing and externalizing problems together, not separately. First, the general psychopathology model assumes that both internalizing and externalizing problems shared a generalized underlying vulnerability etiology (i.e., common syndrome explanations) in which symptoms of distinct problematic behaviors are, in part, explained by one general psychopathology factor (p-factor) that reflects common features across all forms of psychopathology (Caspi & Moffitt, 2018). Conceptually, like the ‘g’ factor of intelligence in cognitive studies, the p-factor assumes that symptoms are influenced by a common etiology, which can “measure a person’s liability to mental disorder, comorbidity among disorders, persistence of disorders over time, and severity of symptoms” (Caspi & Moffitt, 2018; pp. 831). Second, directional models highlight that internalizing and externalizing problems often do not

develop solely by itself, but usually through the causal/directional influences of its source. In one direction, the coercion-dual failure model proposed that children who showed high externalizing problems experience academic and interpersonal failures which, in turn, may be associated with internalizing problems in both clinical and community-based samples (Lee & Bukowski, 2012; Capaldi & Stoolmiller, 1999; Patterson & Stoolmiller, 1991; Fergusson, Goodwin, & Horwood, 2003). In another direction, there is also theoretical evidence termed as masked depression suggested that depressive children may show “burning out” externalizing problems as they express their emotion by acting out (Glaser, 1967; Capaldi, 1991). Thirdly, the anxiety model (Granic, 2014; Woltering & Lewis, 2013) argues that negative emotionality (e.g., many worries, many fears, easily scared) and frustration may “boil over” and drive and maintain externalizing problems through insufficient self-regulation capacities. Lastly, internalizing and externalizing problems may be reciprocally related to each other like change in one are often associated with changes in the other (Gilliom & Shaw, 2004; Keiley, Bates, Dodge, & Pettit, 2000; Measelle, Stice, & Hogansen, 2006; Sourander & Helstelä, 2005). It seems insufficient to shed light in the way as articulating solely with internalizing problems leading to externalizing problems or solely with externalizing problems leading to internalizing problems. Instead, considering internalizing and externalizing problem together from a co-developmental perspective has become critical for a better understanding of maladjusted behavior since they may operate reciprocally.

1.3. The Relevance of Examining the Development of These Problem Behaviors

Despite the fact that externalizing and internalizing problems often co-occur, the development of problem behavior also negatively affect the quality-of-life of individuals and their families and poses a large financial burden on society (Allman & Slate, 2011; Levit et al., 2008; Rivenbark et al., 2018). The severe consequences of such psychopathology, along with its

high prevalence, provide a clear rationale for efforts into preventing the development of psychopathology (Center for Behavioral Health Statistics and Quality, 2015). Longitudinal developmental studies are critical for addressing questions relating to how and why children deviate from more normative developmental pathways and develop various forms of problem behaviors and contribute to innovative prevention/intervention applications.

1.4. Development of Externalizing Problems

On average, the development of externalizing problems showed a gradually decreasing trend from early childhood to late adolescence (Bongers, Koot, van der Ende, & Verhulst, 2003; Costello et al., 2003) often attributed to increased self-regulation capacities (Nigg, 2017; Woltering & Shi, 2016) and improved verbal communicative skills (Tremblay, 2000).

Substantial heterogeneous trajectories have been identified for Externalizing Problems, including High-stable (chronic), Moderate stable, High-desisting, Adolescent-onset, and Low-stable (normal group) trajectories emerged from extant literature in childhood (Fanti & Henrich, 2007; Latendresse et al., 2011; Silver, Measelle, Armstrong, & Essex, 2010; Shaw, Lacourse, & Nagin, 2005), adolescence (Moffitt, 1993), and across childhood to adolescence (Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006). Broidy et al. (2003) found three to five differentiated development trajectories among six longitudinal studies focusing on school-aged children and adolescents across three countries (i.e., Montreal study, N=1,037; Quebec provincial study, N=2,000; Christchurch Health and Development Study, N=1,265; Dunedin Multidisciplinary Health and Development Study, N=1,037; Pittsburgh Youth Study, N=1,517; and Child Development Project, N=585). The differentiated trajectories included a high-stable (chronic), moderate stable, high-desisting, adolescent-onset, and low-stable (normal group) trajectory. Most children are showing a low-stable trend of externalizing problem behavior. Only a small

percentage (5% to 7%; Moffitt, 1993) of children follow a life-course persistent trajectory of externalizing problems. The life-course persistent trajectory of externalizing behavior has been associated with prenatal and perinatal medical risks, and these problems have been found to be related to infant neuropsychological risk (Brennan, Hall, Bor, Najman, & Williams, 2003; Moffitt, 1993). Moreover, early deficiencies in cognitive functioning and difficult temperament may set the stage for future chronic externalizing problems. However, among adolescents with a late- (adolescent-) onset trajectory, externalizing problems are more strongly associated with their concurrent social experiences in adolescence as opposed to early childhood factors.

1.5. Development of Internalizing Problems

There is evidence showing that the average developmental path of internalizing problems tends to increase gradually from infancy through adolescence for both nonclinical and clinical populations (Achenbach, Howell, Quay, Conners, 1991; from 4 to 16; Colder, Mott, & Berman, 2002; from age 4 to 8; Costello et al., 2003; from age 9 to 16; Gilliom & Shaw, 2004; from age 2 to 6). It is possible that a more sophisticated cognitive capacity allows for more frequent anticipation of negative events, and that expanded memory capacities have allowed individuals to worry more about stressful events and negative experiences, which may serve as an underlying reason for explaining the increased trend of internalizing problems over time (Kovacs & Devlin, 1998). Another possibility is that emotionally dysregulated children may show tantrums and then experienced punishment and consequences because of their negative emotional attributes, and the negative emotions accumulated and funneled up into anxiety and other internalizing behaviors (Patterson, DeBaryshe, & Ramsey, 1989). Moreover, Keiley, Lofthouse, Bates, Dodge, and Pettit (2003) found that internalizing problems are, on average, stable from 5 to 13 years. There was also evidence of heterogeneity in the development of

internalizing problems as Sterba, Prinstein, and Cox (2007) identified three latent trajectory classes for each gender on a sample of 1,364 children followed from 2 to 11 with two-thirds of children following a low-stable trajectory, and smaller proportions following decreasing/increasing or elevated-stable paths. Evidence showed that the combination of negative emotionality, fearfulness, and negative maternal control contributed to a high, increasing internalizing problem trajectory (Gilliom & Shaw, 2004).

1.6. Statistical Tool for Analyzing Co-occurring Psychopathology Pattern

Longitudinal studies often address the co-developmental mechanism of internalizing and externalizing problems using either variable-centered or person-centered approaches (Bergman & Magnusson, 1997). The variable-centered approach usually examines the transactional (unidirectional or reciprocal) effects to draw the clue of a process among the variables (Lee & Bukowski, 2012). For a long time, most research has been conducting statistical analysis with variables as the main units and formulate theories in terms of variables and hypothetical constructs. Recently, the factorial structure model (i.e., the bi-factor model), considered as a variable-centered approach, has also been utilized to capture the shared and unique features of internalizing and externalizing problems. Different from the variable-centered approach, the person-centered approach aims to identify individuals of interest and to understand how they differ from others. The person-centered approach has its unique advantages compared to a variable-centered approach. For instance, Bergman and Magnusson (1997) summarized the limitations of the variable-centered approach as “the modeling/description of variables over individuals can be very difficult to translate into properties characterizing provided by the statistical method is variable oriented, not individual-oriented (p. 292)”. In other words, the person-centered approach has a clear benefit of forming groups of individuals based on

characteristics. In contrast, a variable-centered approach focuses on how each latent variable (or characteristics) as related to another latent variable.

1.7. Individual and Contextual Antecedents

1.7.1. Early Individual Antecedents: Temperament, Language Ability, Intelligence, Gender, and Ethnicity

Studies on resiliency have begun to elucidate why some at-risk children can adapt successfully despite adverse conditions (Masten et al., 1990; Kwok, Hughes, & Luo, 2007). Ego-resiliency (ER), conceptualized as a personality trait and having roots in temperament research, has been defined as a positive regulatory adaptation process in which individuals modify their behaviors and emotions flexibly according to the presented circumstances. ER, different from other aspects of temperament (e.g., effortful control, inhibitory control, negative emotionality; Eisenberg et al., 2004), focuses on skills such as being resourceful, persistent, and easily adaptable, and the use of strategies to cope with adverse circumstances as well as a willingness to change behavior when needed (Block & Block; 2014). Consistent with this notion, previous results indicate that individuals low in ego-resiliency are more likely than their ego-resilient peers to exhibit externalizing or internalizing problems (Eisenberg et al., 2003, 2004, 2010). However, low ego-resiliency tends to be a stronger predictor for internalizing than externalizing problems (Eisenberg et al., 2003, 2004; Hofer, Eisenberg, & Reiser, 2010; Martel et al., 2007; Milioni et al., 2015). More specifically, studying a high-risk sample of adolescents (from 12 to 17 years old), Martel and colleagues (2007) found that although problem behaviors were associated with both early personality and executive functioning, these associations varied for different domains of problem behaviors. Low resiliency, response inhibition, and reactive control were predictive of the development of internalizing problems, but only response inhibition and

weak reactive control (but not resiliency) predicted externalizing problems. Aside from ER, other temperamental factors such as child temperamental resistance to control (Keiley et al., 2003) and difficult temperament (Fanti & Henrich, 2010) have been found to be uniquely associated with the development of externalizing problems, while temperamental inadaptability uniquely predicted the development of internalizing difficulties (Keiley et al., 2003). However, the common and unique associations of ER in differentiating the development of pure and co-occurring internalizing and externalizing problems remains unclear.

There has been a large body of research that has evaluated how children's language development is associated with problem behaviors (Chow & Wehby, 2018; Hollo, Wehby, & Oliver, 2014; Masten et al., 2005). Although two recent meta-analyses (Chow & Wehby, 2018; Hollo et al., 2014) provide support for the premise that poor early language skills contribute to both internalizing and externalizing problems in typical and atypical samples (e.g., children with emotional and behavioral disorders), these meta-analyses did not specifically consider the role of language ability in the development of co-occurring internalizing and externalizing problems.

Ample cross-sectional and longitudinal studies have found that children's low intelligence serves as a risk factor in the development of internalizing and externalizing problems over time (Weeks et al., 2014; Francis, Hawes, & Abbott, 2016). Children with lower intelligence may have deficits in problem-solving (Emerson, Mollet, & Harrison, 2005) and memory functioning (Vasa et al., 2007), which increases the likelihood of internalizing problems. Moreover, lower intelligence has also been associated with externalizing problems since individuals with lower intelligence may misinterpret social information as hostile and intentional, rather than accidental, and in turn, react aggressively (Lansford et al., 2006).

With regard to gender and ethnicity, gender differences are frequently observed, with females typically showing higher rates of internalizing symptoms (Keiley et al., 2000) and males having higher rates of externalizing symptoms (Martel, 2013; Rosenfield & Mouzon, 2013) and co-occurring problems (Somersalo, Solanta, & Almqvist, 1999). Researchers have also suggested that ethnic minorities experience unique stressors that may contribute to differences in behavior and mental health symptoms (Toomey, Umaña-Taylor, Updegraff, & Jahromi, 2013; Unnever, Cullen, & Barnes, 2016).

1.7.2. Early Contextual Antecedents: Parent, Teacher, and Peer Relationships

Consistent with family stress perspectives, extant studies provide support for the premise that early family socioeconomic adversity, such as exposure to poverty, low maternal education, coming from a single-parent household, and high family financial stress, may lead to increased depression, anxiety, and hostility in parents (Gallo & Matthews, 1999), which in turn reduce the capacity of caregivers to provide sensitive and responsive parenting (Conger et al., 2002). Maternal warmth, support and responsiveness have been demonstrated to be pivotal in influencing children's adjustment, particularly, externalizing problems in early and middle childhood (Caspi et al., 2004; Etekal et al., 2019; Okado & Haskett, 2015). In contrast, children whose parents provide them with lower levels of support and responsiveness often demonstrate higher levels of externalizing and internalizing behavior problems throughout childhood (Bradley et al., 2001). Studies focusing on adolescence have also shown that various parenting styles (i.e., support, proactive, punitive, and psychological control) are associated with adolescents' aggression and rule-breaking behaviors (Van Heel et al., 2019). In addition to its effects on parenting, family socioeconomic adversity has been found to be uniquely associated

with the development of externalizing problems, but not with internalizing problems (Keiley et al., 2003).

Reformulations of attachment theory (Pianta, 1999; Verschueren & Koomen, 2012) and other relationship-driven models (Baker, Grant, & Morlock, 2008) have evaluated the premise that teacher-child relationships influence the development of children's problem behaviors. Low quality relationships with teachers, characterized by low warmth and high conflict may increase students' insecurity and feelings of distress, leading to increases in both internalizing and externalizing problems (Birch & Ladd, 1998; Hamre & Pianta, 2001; Silver et al., 2005). For example, in a longitudinal study, Hamre and Pianta (2001) found that negativity in teacher-student relationships in kindergarten predicted poor behavioral outcomes until upper elementary school and the effects persisted for boys until middle school. A study by O'Connor and colleagues (2011) found that teacher-child relationship quality was the only factor associated with both internalizing and externalizing problems after controlling for various child and family factors, however, these investigators examined internalizing and externalizing problems as distinct outcomes, and did not assess their co-occurring development.

Peer rejection, or the extent to which children are disliked by their peers, has been consistently associated with higher rates of externalizing problems (Coie, Lochman, Terry, & Hyman, 1992; Chen, Drabick, & Burgers, 2015; Janssens et al., 2017). There is also evidence that having a low social status and being rejected by peers can contribute to symptoms of fearfulness, anxiety, and social withdrawal (Coie et al., 1992; Sentse, Prinzie, & Salmivalli, 2017). With respect to examining co-occurring problem behaviors, Keiley et al. (2003) found that peer rejection served as an antecedent for both pure-externalizing and co-occurring problems.

1.7.3. Academic Performance

Links between academic underachievement and difficulties in behavioral adjustment have long been established. In childhood, inattention and hyperactivity are stronger correlates of academic problems than is aggression; by adolescence, however, antisocial behavior and delinquency are associated with underachievement (Hinshaw, 1992). Moreover, Deighton et al., (2018) investigated links between internalizing symptoms, externalizing problems, and academic attainment during middle childhood and early adolescence on a combined sample of 5,878 children, the results provided consistent evidence of the harmful effect of externalizing problems on later academic achievement, supporting the adjustment-erosion hypothesis. Evidence linking internalizing symptoms to academic performance over time is sparser and less consistent by comparison. Grover, Ginsburg, and Ialongo (2007) examined concurrent and long-term psychosocial outcomes associated with anxiety symptoms among a community sample of predominantly low-income African Americans, and the results showed that high-anxious first graders, compared to their low-anxious peers, scored significantly lower on measures of academic achievement.

Internalizing and externalizing problems are associated with poor academic performance in both concurrently and longitudinally manner, and it has been well established that children's internalizing and externalizing problems are negatively related to academic achievement (see Moilanen, Shaw, & Maxwell, 2010; Riglin et al., 2014). For instance, Moilanen, Shaw, and Maxwell (2010) examined the longitudinal associations between internalizing, externalizing and academic competence on a sample of 291 at-risk boys and discovered that high levels of externalizing problems were associated with both high levels of internalizing problems and low levels of academic competence during the early school-age period, and with increased

internalizing problems during the transition to adolescence. One meta-analysis conducted by 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.

1.8. Proposed Research Questions for the Dissertation

My overall objective for this dissertation is to address three main issues: (a) utilize both variable- and person-centered approaches to explore the co-development mechanism of internalizing and externalizing problems. Specifically, in terms of a person-centered approach, to identify individuals with distinct co-development patterns of internalizing and externalizing problems using latent growth curve analysis (LGCAs); in terms of a variable-centered approach, to examine the pure and co-occurring factors of internalizing and externalizing problems using bi-factor models, and (b) investigate what the best early childhood predictor(s) are for explaining the underlying mechanism of co-development patterns of internalizing and externalizing problems using both a person-centered and a variable-centered approach and (c) examine what adolescence outcome(s) are associated with the underlying mechanism of co-development patterns of internalizing and externalizing problems using both a person-centered and a variable-centered approach. The current dissertation is composed of three articles, each related to three proposed specific aims:

1.8.1. Specific Aim # 1: Explore the Co-development Mechanism of Internalizing and Externalizing Problems from Both Variable and Person-centered Approach

In terms of the variable-centered approach, my hypothesis is to identify the existence of a GP factor, which indicate the severity of day-to-day internalizing and externalizing problem which can be captured by a general dimension. I would also expect externalizing items were

better captured by the GP factor as Kóbor, Takács and Urbán (2013) found “difficulties concerning hyperactive-impulsive behavior and conduct disorder are the most important or salient when a child’s behavior is being evaluated (pp. 305).”

In terms of the person-centered approach, my working hypothesis is to identify pure-internalizing, pure-externalizing, co-occurring problems, and no-risk four co-development classes for children in the face of adversity in my sample. I also hypothesize that the majority of the children will belong to the low-risk category (low on both internalizing and externalizing) and that more than 3 to 10% of the sample (based on previous studies focusing on community samples) would show co-occurring symptoms since my sample is considered to be at risk. Since externalizing problems are more salient/observable than internalizing problems, I would also expect more children to show pure-externalizing compared to pure-internalizing problems.

1.8.2. Specific Aim # 2: Investigate Predictive Effects of Early Childhood Predictor(s) on Co-developmental Mechanism

I hypothesize that the above-mentioned earlier individual and contextual precursors would work in a cumulative manner on influencing future developmental maladjustments. Though the shared and unique precursors associated with pure and co-occurring problems remain exploratory in the current study, I still expect non-resilient temperament and negative social processes at home and school work as salient risk precursors for pure and co-occurring problems. Focusing on the person-centered approach, children who have co-occurring problems over time are expected to experience harsher forms of early childhood risk precursors in comparison with children who are no-risk or have just pure-internalizing or pure-externalizing problems.

1.8.3. Specific Aim # 3: Examine Longitudinal Outcome(s) Are Associated with the Co-developmental Mechanism

In alignment with the concept of equifinality, my working hypothesis using the person-centered approach is that children and adolescents with various co-development patterns of internalizing and externalizing problems will experience a higher level of escalated behavioral maladjustment, peer rejections, conflicted teacher-child relationship, and academic deficits later in life.

1.9. Impact

At the completion of this study, it is my expectation to establish a comprehensive examination of the association between early childhood characteristics and adolescence school adjustments with developmental psychopathology from a co-development perspective. In addition, I anticipate having demonstrated the importance of considering the development of internalizing and externalizing problems from a co-development perspective. This dissertation topic has the potential to provide a positive impact on creating a pedagogy that decreases internalizing and externalizing development.

1.10. References

Achenbach, T. M., & Edelbrock, C. S. (1978). The classification of child psychopathology: a

review and analysis of empirical efforts. *Psychological Bulletin*, 85, 1275–1301.

Achenbach, T. M., Howell, C. T., Quay, H. C., & Conners, C. K. (1991). National survey of problems and competencies among 4– to 16–year olds: Parents’ reports for normative and clinical samples. *Monographs of the Society for Research in Child Development*, 56, 1–131.

- Achenbach, T. M., Ivanova, M. Y., Rescorla, L. A., Turner, L. V., & Althoff, R. R. (2016). Internalizing/externalizing problems: Review and recommendations for clinical and research applications. *Journal of the American Academy of Child & Adolescent Psychiatry*, *55*(8), 647-656.
- Allman, K. L., & Slate, J. R. (2011). School discipline in public education: A brief review of current practices. *International Journal of Educational Leadership Preparation*, *6*, 1–7.
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub.
- Baker, J. A., Grant, S., & Morlock, L. (2008). The teacher–student relationship as a developmental context for children with internalizing or externalizing behavior problems. *School Psychology Quarterly*, *23*, 3–15.
- Bergman, L. R., & Magnusson, D. (1997). A person-oriented approach in research on developmental psychopathology. *Development and Psychopathology*, *9*, 291–319.
- Birch, S. H., & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher–child relationship. *Developmental Psychology*, *34*, 934–946.
- Block, J. H., & Block, J. (2014). The role of ego-control and ego-resiliency in the organization of behavior. In *Development of cognition, affect, and social relations* (pp. 49–112). Psychology Press.
- Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2003). The normative development of child and adolescent problem behavior. *Journal of Abnormal Psychology*, *112*, 179–192.

- Bradley, R. H., Corwyn, R. F., Burchinal, M., McAdoo, H. P., & García Coll, C. (2001). The home environments of children in the United States Part II: Relations with behavioral development through age thirteen. *Child Development, 72*, 1868–1886.
- Brennan, P. A., Hall, J., Bor, W., Najman, J. M., & Williams, G. (2003). Integrating biological and social processes in relation to early-onset persistent aggression in boys and girls. *Developmental Psychology, 39*, 309–323.
- Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, B., Dodge, K. A., ... & Lynam, D. R. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: a six-site, cross-national study. *Developmental Psychology, 39*, 222–245.
- Burcusa, S. L., Iacono, W. G., & McGue, M. (2003). Adolescent twins discordant for major depressive disorder: shared familial liability to externalizing and other internalizing disorders. *Journal of Child Psychology and Psychiatry, 44*, 997–1005.
- Capaldi, D. M. (1991). Co-occurrence of conduct problems and depressive symptoms in early adolescent boys: I. Familial factors and general adjustment at Grade 6. *Development and Psychopathology, 3*, 277–300.
- Capaldi, D. M., & Stoolmiller, M. (1999). Co-occurrence of conduct problems and depressive symptoms in early adolescent boys: III. Prediction to young-adult adjustment. *Development and Psychopathology, 11*, 59–84.
- Caspi, A., & Moffitt, T. E. (2018). All for one and one for all: Mental disorders in one dimension. *American Journal of Psychiatry, 175*, 831–844.
- Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., Meier, M., Ramrakha, S., Shalev, I., Poulton, R. & Moffitt, T. E. (2014). The p factor one

- general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science*, 2, 119–137.
- Caspi, A., Moffitt, T. E., Morgan, J., Rutter, M., Taylor, A., Arseneault, L., ... & Polo-Tomas, M. (2004). Maternal expressed emotion predicts children's antisocial behavior problems: using monozygotic-twin differences to identify environmental effects on behavioral development. *Developmental Psychology*, 40, 149–161.
- Center for Behavioral Health Statistics and Quality. (2015). Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health (HHS Publication No. SMA 15–4927, NSDUH Series H–50). Retrieved from <http://www.samhsa.gov/data/>
- Chen, D., Drabick, D. A., & Burgers, D. E. (2015). A developmental perspective on peer rejection, deviant peer affiliation, and conduct problems among youth. *Child Psychiatry & Human Development*, 46, 823–838.
- Chen, R., & Simons–Morton, B. (2009). Concurrent changes in conduct problems and depressive symptoms in early adolescents: A developmental person–centered approach. *Development and Psychopathology*, 21, 285–307.
- Chow, J. C., & Wehby, J. H. (2018). Associations between language and problem behavior: A systematic review and correlational meta–analysis. *Educational Psychology Review*, 30, 61–82.
- Coie, J. D., Lochman, J. E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *Journal of Consulting and Clinical Psychology*, 60, 783–792.

- Coie, J. D., Lochman, J. E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *Journal of Consulting and Clinical Psychology, 60*, 783–792.
- Conger, R. D., Wallace, L. E., Sun, Y., Simons, R. L., McLoyd, V. C., & Brody, G. H. (2002). Economic pressure in African American families: A replication and extension of the family stress model. *Developmental Psychology, 38*, 179–193.
- Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry, 60*, 837–844.
- Cote, S. M., Vaillancourt, T., LeBlanc, J. C., Nagin, D. S., & Tremblay, R. E. (2006). The development of physical aggression from toddlerhood to preadolescence: A nationwide longitudinal study of Canadian children. *Journal of Abnormal Child Psychology, 34*, 71–85.
- Cramer, A. O., Waldorp, L. J., van der Maas, H. L., & Borsboom, D. (2010). Comorbidity: a network perspective. *Behavioral and Brain Sciences, 33*, 137–150.
- Deighton, J., Humphrey, N., Belsky, J., Boehnke, J., Vostanis, P., & Patalay, P. (2018). Longitudinal pathways between mental health difficulties and academic performance during middle childhood and early adolescence. *British Journal of Developmental Psychology, 36*(1), 110–126.
- Eisenberg, N., Haugen, R., Spinrad, T. L., Hofer, C., Chassin, L., Zhou, Q., ... & Liew, J. (2010). Relations of temperament to maladjustment and ego resiliency in at-risk children. *Social Development, 19*, 577–600.

- Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A., ... & Thompson, M. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development, 75*, 25–46.
- Eisenberg, N., Valiente, C., Fabes, R. A., Smith, C. L., Reiser, M., Shepard, S. A., ... & Cumberland, A. J. (2003). The relations of effortful control and ego control to children's resiliency and social functioning. *Developmental Psychology, 39*, 761–776.
- Emerson, C.S., Mollet, G.A., Harrison, D.W. (2005). Anxious-depression in boys: an evaluation of executive functioning. *Archives of Clinical Neuropsychology 20*, 539–546.
- Esch, P., Bocquet, V., Pull, C., Couffignal, S., Lehnert, T., Graas, M., ... & Ansseau, M. (2014). The downward spiral of mental disorders and educational attainment: a systematic review on early school leaving. *BMC Psychiatry, 14*(1), 237–.
- Ettekal, I., Eiden, R. D., Nickerson, A. B., Molnar, D. S., & Schuetze, P. (2019). Developmental cascades to children's conduct problems: The role of prenatal substance use, socioeconomic adversity, maternal depression and sensitivity, and children's conscience. *Development and Psychopathology*, 1–19.
- Fanti, K. A., & Henrich, C. C. (2010). Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: findings from the National Institute of Child Health and Human Development Study of Early Child Care. *Developmental Psychology, 46*(5), 1159–1175.
- Fergusson, D. M., Goodwin, R. D., & Horwood, L. J. (2003). Major depression and cigarette smoking: results of a 21-year longitudinal study. *Psychological Medicine, 33*, 1357–1367.

- Ford, T., Goodman, R., & Meltzer, H. (2003). The British child and adolescent mental health survey 1999: the prevalence of DSM-IV disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*, 1203–1211.
- Francis, R., Hawes, D. J., & Abbott, M. (2016). Intellectual giftedness and psychopathology in children and adolescents: A systematic literature review. *Exceptional Children, 82*, 279–302.
- Gallo, L. C., & Matthews, K. A. (1999). Do negative emotions mediate the association between socioeconomic status and health? *Annals of the New York Academy of Sciences, 896*, 226–245.
- Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology, 16*, 313–333.
- Glaser, K. (1967). Masked depression in children and adolescents. *American Journal of Psychotherapy, 21*, 565–574.
- Granic, I. (2014). The role of anxiety in the development, maintenance, and treatment of childhood aggression. *Development and Psychopathology, 26*, 1515–1530.
- Grover, R. L., Ginsburg, G. S., & Ialongo, N. (2007). Psychosocial outcomes of anxious first graders: A seven-year follow-up. *Depression and Anxiety, 24*(6), 410–420.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher–child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development, 72*, 625–638.
- Hinnant, J. B., & El-Sheikh, M. (2013). Codevelopment of externalizing and internalizing symptoms in middle to late childhood: Sex, baseline respiratory sinus arrhythmia, and respiratory sinus arrhythmia reactivity as predictors. *Development and Psychopathology, 25*, 419–436.

- Hinshaw, S. P. (1992). Academic underachievement, attention deficits, and aggression: comorbidity and implications for intervention. *Journal of Consulting and Clinical Psychology, 60*(6), 893–903.
- Hofer, C., Eisenberg, N., & Reiser, M. (2010). The role of socialization, effortful control, and ego resiliency in French adolescents' social functioning. *Journal of Research on Adolescence, 20*, 555–582.
- Hollo, A., Wehby, J. H., & Oliver, R. M. (2014). Unidentified language deficits in children with emotional and behavioral disorders: A meta-analysis. *Exceptional Children, 80*(2), 169–186.
- Janssens, A., Van Den Noortgate, W., Goossens, L., Verschueren, K., Colpin, H., Claes, S., ... & Van Leeuwen, K. (2017). Adolescent externalizing behaviour, psychological control, and peer rejection: Transactional links and dopaminergic moderation. *British Journal of Developmental Psychology, 35*, 420–438.
- Keenan, K., Shaw, D. S., Walsh, B., Delliquadri, E., & Giovannelli, J. (1997). DSM-III-R disorders in preschool children from low-income families. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(5), 620-627.
- Keiley, M. K., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2000). A cross-domain growth analysis: Externalizing and internalizing behaviors during 8 years of childhood. *Journal of Abnormal Child Psychology, 28*, 161–179.
- Keiley, M. K., Lofthouse, N., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2003). Differential risks of covarying and pure components in mother and teacher reports of externalizing and internalizing behavior across ages 5 to 14. *Journal of Abnormal Child Psychology, 31*, 267–283.

- Kessler, R. C., Ormel, J., Petukhova, M., McLaughlin, K. A., Green, J. G., Russo, L. J., ... & Andrade, L. (2011). Development of lifetime comorbidity in the World Health Organization world mental health surveys. *Archives of General Psychiatry*, *68*, 90–100.
- Kóbor, A., Takács, Á., & Urbán, R. (2013). The bi-factor model of the Strengths and Difficulties Questionnaire. *European Journal of Psychological Assessment*, *29*, 299–307.
- Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... & Eaton, N. R. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology*, *126*, 454.
- Kovacs, M., & Devlin, B. (1998). Internalizing disorders in childhood. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *39*, 47–63.
- Krueger, R. F., & DeYoung, C. G. (2016). The RDoC initiative and the structure of psychopathology. *Psychophysiology*, *53*, 351–354.
- Krueger, R. F., & Markon, K. E. (2011). A dimensional-spectrum model of psychopathology: Progress and opportunities. *Archives of General Psychiatry*, *68*, 10–11.
- Kwok, O. M., Hughes, J. N., & Luo, W. (2007). Role of resilient personality on lower achieving first grade students' current and future achievement. *Journal of School Psychology*, *45*, 61–82.
- Lansford, J. E., Malone, P. S., Dodge, K. A., Crozier, J. C., Pettit, G. S., & Bates, J. E. (2006). A 12-year prospective study of patterns of social information processing problems and externalizing behaviors. *Journal of Abnormal Child Psychology*, *34*, 709–718.
- Latendresse, S. J., Bates, J. E., Goodnight, J. A., Lansford, J. E., Budde, J. P., Goate, A., ... & Dick, D. M. (2011). Differential susceptibility to adolescent externalizing trajectories:

- Examining the interplay between CHRM2 and peer group antisocial behavior. *Child Development, 82*, 1797–1814.
- Leadbeater, B. J., Kuperminc, G. P., Blatt, S. J., & Hertzog, C. (1999). A multivariate model of gender differences in adolescents' internalizing and externalizing problems. *Developmental Psychology, 35*, 1268–1282.
- Lee, E. J., & Bukowski, W. M. (2012). Co-development of internalizing and externalizing problem behaviors: Causal direction and common vulnerability. *Journal of Adolescence, 35*, 713–729.
- Levit, K. R., Kassed, C. A., Coffey, R. M., Mark, T. L., McKusick, M. D. R., King, E. C., ... & Stranges, E. (2008). Projections of national expenditures for mental health services and substance abuse treatment. Substance Abuse and Mental Health Services Administration. Retrieved from:
http://www.choopersguide.com/custom/domain_1/extra_files/attach_1_8.pdf
- Martel, M. M. (2013). Sexual selection and sex differences in the prevalence of childhood externalizing and adolescent internalizing disorders. *Psychological Bulletin, 139*, 1221–1259.
- Martel, M. M. (2013). Sexual selection and sex differences in the prevalence of childhood externalizing and adolescent internalizing disorders. *Psychological Bulletin, 139*, 1221–1259.
- Martel, M. M., Nigg, J. T., Wong, M. M., Fitzgerald, H. E., Jester, J. M., Puttler, L. I., ... & Zucker, R. A. (2007). Childhood and adolescent resiliency, regulation, and executive functioning in relation to adolescent problems and competence in a high-risk sample. *Development and Psychopathology, 19*, 541–563.

- Masten, A. S., Best, K. M., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology, 2*, 425–444.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., Boelcke–Stennes, K., & Tellegen, A. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*, 733–746.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., Boelcke–Stennes, K., & Tellegen, A. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*, 733–746.
- McConaughy, S. H., & Skiba, R. J. (1993). Comorbidity of externalizing and internalizing problems. *School Psychology Review, 22*, 421–436.
- Measelle, J. R., Stice, E., & Hogansen, J. M. (2006). Developmental trajectories of co–occurring depressive, eating, antisocial, and substance abuse problems in female adolescents. *Journal of Abnormal Psychology, 115*, 524–538.
- Merikangas, K. R., He, J. P., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., ... & Swendsen, J. (2010). Lifetime prevalence of mental disorders in US adolescents: results from the National Comorbidity Survey Replication–Adolescent Supplement (NCS–A). *Journal of the American Academy of Child & Adolescent Psychiatry, 49*, 980–989.
- Milioni, M., Alessandri, G., Eisenberg, N., Vecchione, M., & Caprara, G. V. (2015). The predictive role of ego resiliency on behavioural problems. *European Journal of Developmental Psychology, 12*, 220–233.

- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674–701.
- 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.
- Newman, D. L., Moffitt, T. E., Caspi, A., & Silva, P. A. (1998). Comorbid mental disorders: implications for treatment and sample selection. *Journal of Abnormal Psychology*, *107*, 305–311.
- Nigg, J. T. (2017). Annual Research Review: On the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *58*, 361–383.
- Nivard, M. G., Lubke, G. H., Dolan, C. V., Evans, D. M., Pourcain, B. S., Munafò, M. R., & Middeldorp, C. M. (2017). Joint developmental trajectories of internalizing and externalizing disorders between childhood and adolescence. *Development and Psychopathology*, *29*, 919–928.
- O'Connor, E. E., Dearing, E., & Collins, B. A. (2011). Teacher-child relationship and behavior problem trajectories in elementary school. *American Educational Research Journal*, *48*, 120–162.
- Okado, Y., Haskett, M. E. (2015). Three-year trajectories of parenting behaviors among physically abusive parents and their link to child adjustment. *Child & Youth Care Forum: Journal of Research and Practice in Children's Services*, *44*, 613–633.

- Oland, A. A., & Shaw, D. S. (2005). Pure versus co-occurring externalizing and internalizing symptoms in children: The potential role of socio-developmental milestones. *Clinical Child and Family Psychology Review, 8*, 247–270.
- Patterson, G. R., & Stoolmiller, M. (1991). Replications of a dual failure model for boys' depressed mood. *Journal of Consulting and Clinical Psychology, 59*, 491–498.
- Patterson, G.R., DeBaryshe, B., & Ramsey, E. (1990). A developmental perspective on antisocial behavior. *American Psychologist, 44*, 329–335.
- Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. American Psychological Association.
- Rivenbark, J. G., Odgers, C. L., Caspi, A., Harrington, H., Hogan, S., Houts, R. M., ... & Moffitt, T. E. (2018). The high societal costs of childhood conduct problems: evidence from administrative records up to age 38 in a longitudinal birth cohort. *Journal of Child Psychology and Psychiatry, 59*, 703–710.
- Rosenfield, S., & Mouzon, D. (2013). Gender and mental health. In *Handbook of the sociology of mental health* (pp. 277–296). Springer, Dordrecht.
- Sentse, M., Prinzie, P., & Salmivalli, C. (2017). Testing the direction of longitudinal paths between victimization, peer rejection, and different types of internalizing problems in adolescence. *Journal of Abnormal Child Psychology, 45*, 1013–1023.
- Shaw, D. S., Lacourse, E., & Nagin, D. S. (2005). Developmental trajectories of conduct problems and hyperactivity from ages 2 to 10. *Journal of Child Psychology and Psychiatry, 46*, 931–942.

- Silver, R. B., Measelle, J. R., Armstrong, J. M., & Essex, M. J. (2010). The impact of parents, child care providers, teachers, and peers on early externalizing trajectories. *Journal of School Psychology, 48*, 555–583.
- Silver, R. B., Measelle, J. R., Armstrong, J. M., & Essex, M. J. (2010). The impact of parents, child care providers, teachers, and peers on early externalizing trajectories. *Journal of School Psychology, 48*, 555–583.
- Somersalo, H., Solantaus, T., & Almqvist, F. (1999). Four-year course of teacher-reported internalizing, externalizing and comorbid syndromes. *European Child & Adolescent Psychiatry, 8*, 89–97.
- Sourander, A., & Helstelä, L. (2005). Childhood predictors of externalizing and internalizing problems in adolescence. *European Child & Adolescent Psychiatry, 14*, 415–423.
- Sterba, S. K., Prinstein, M. J., & Cox, M. J. (2007). Trajectories of internalizing problems across childhood: Heterogeneity, external validity, and gender differences. *Development and Psychopathology, 19*, 345–366.
- Toomey, R. B., Umaña-Taylor, A. J., Updegraff, K. A., & Jahromi, L. B. (2013). Ethnic identity development and ethnic discrimination: Examining longitudinal associations with adjustment for Mexican-origin adolescent mothers. *Journal of Adolescence, 36*, 825–833.
- Unnever, J. D., Cullen, F. T., & Barnes, J. C. (2016). Racial discrimination, weakened school bonds, and problematic behaviors: Testing a theory of African American offending. *Journal of Research in Crime and Delinquency, 53*, 139–164.
- Van Heel, M., Van Den Noortgate, W., Bijttebier, P., Colpin, H., Goossens, L., Verschueren, K., & Van Leeuwen, K. (2019). Parenting and externalizing problem behavior in

- adolescence: Combining the strengths of variable-centered and person-centered approaches. *Developmental Psychology*, *55*, 653–673.
- Vasa, R.A., Roberson-Nay, R., Klein, R.G., Mannuzza, S., Moulton, J.L., Guardino, M., Merikangas, A., Carlino, A.R., Pine, D.S. (2007). Memory deficits in children with and at risk for anxiety disorders. *Depression and Anxiety* *24*, 85–94.
- Verschueren, K., & Koomen, H. M. (2012). Teacher–child relationships from an attachment perspective. *Attachment & Human Development*, *14*, 205–211.
- Weeks, M., Ploubidis, G. B., Cairney, J., Wild, T. C., Naicker, K., & Colman, I. (2016). Developmental pathways linking childhood and adolescent internalizing, externalizing, academic competence, and adolescent depression. *Journal of Adolescence*, *51*, 30–40.
- Weeks, M., Wild, T. C., Ploubidis, G. B., Naicker, K., Cairney, J., North, C. R., & Colman, I. (2014). Childhood cognitive ability and its relationship with anxiety and depression in adolescence. *Journal of Affective Disorders*, *152*, 139–145.
- Wiggins, J. L., Mitchell, C., Hyde, L. W., & Monk, C. S. (2015). Identifying early pathways of risk and resilience: The codevelopment of internalizing and externalizing symptoms and the role of harsh parenting. *Development and Psychopathology*, *27*, 1295–1312.
- Woltering, S., & Lewis, M. D. (2013). Changing the neural mechanism of emotion regulation in children with behavior problems. In D. Hermans, B. Rimé, & B. Mesquita (Eds.), *Changing Emotions* (pp. 37–43). East Sussex: Psychology Press.
- Zahn–Waxler, C., Klimes–Dougan, B., & Slattery, M. J. (2000). Internalizing problems of childhood and adolescence: Prospects, pitfalls, and progress in understanding the development of anxiety and depression. *Development and Psychopathology*, *12*, 443–466.

2. CONCEPTUALIZING CO-OCCURRING INTERNALIZING AND EXTERNALIZING PROBLEMS FROM BOTH VARIABLE AND PERSON -CENTERED APPROACH

2.1. Introduction

Traditionally, symptoms of child and adolescent psychopathology have been categorized as either internalizing (social withdrawal, anxiety, depression, and psychosomatic reactions) or externalizing (delinquency, aggressive behaviors, attention problems) problems (Achenbach & Edelbrock; 1978; Kotov et al., 2017; Krueger & Markon, 2011). Such problem behaviors not only negatively affect the quality-of-life of individuals and their families, but also pose a large financial burden on society (Allman & Slate, 2011; Levit et al., 2008; Rivenbark et al., 2017). The severe consequences of psychopathology, along with its high prevalence, provide a clear rationale for efforts into preventing the development of psychopathology (Center for Behavioral Health Statistics and Quality, 2015). Longitudinal studies examining early risk factors are key to informing our understanding of the etiology of internalizing and externalizing problem behaviors (Cosgrove et al., 2011; Tackett et al., 2013), and can aid in appropriate, evidence-based prevention effort.

The distinction between internalizing and externalizing problems, however, is not without controversy; high rates of co-occurrence between internalizing and externalizing problems consistently challenge the nosology of the Diagnostic and Statistical Manual of Mental Disorders (DSM) diagnostic categories (Krueger & Markon, 2006). In psychiatry, co-occurrence between internalizing and externalizing is common, rather than the exception: 50% of those who qualify for a diagnosis qualify for more than one (Newman, Moffitt, Caspi & Silva, 1998). Despite this high level of co-occurrence, treatments and prevention programs are frequently designed for, and

tested with, individuals with only one disorder. Furthermore, studies often fail to identify unique risk factors for children with comorbid psychopathology, which complicates intervention (Kessler, Chiu, Demler, & Walters, 2005). These limitations have prompted researchers to seek new paradigms for understanding psychopathology (Krueger & Piasecki, 2002).

2.1.1. Conceptualization of Co-occurring Problems from Variable-centered Approach

Recently, studies driven by findings of high co-occurrence and interrelatedness of different forms of psychopathology in adults have led to the development of a framework in which symptoms of psychiatric disorders are, in part, explained by one general psychopathology factor that reflects common features across all forms of psychopathology through factor analytical studies (Caspi et al., 2014; Lahey et al., 2012, 2017). Conceptually, like the ‘g’ factor of intelligence in cognitive studies, the general psychopathology factor assumes that symptoms are influenced by a common etiology that is not associated with specific factors underlying domain-specific problem behaviors such as internalizing or externalizing problems. Caspi and Moffitt (2018) specifically highlighted that this single dimension of general psychopathology is able to “measure a person’s liability to mental disorder, comorbidity among disorders, persistence of disorders over time, and severity of symptoms” (pp. 831). Confirmatory Factor Analysis (CFA) is commonly used to capture general psychopathology in questionnaire measurement tools. Compared with utilizing composite scores of DSM-like syndromes, factorial models have two unique advantages: (a) they allow individual items to be equipped with different weights (as certain items can represent certain syndromes better); and (b) they help to reduce the measurement error by only extracting the common variance among items (the score for each item is weighted by its contribution to the trait) and contribute to a cleaner measure of

psychopathology (Fornell & Larcker, 1981). Each person's domain-specific or general underlying psychopathology can be estimated with a factorial model.

Using CFA, three standard models are frequently used to examine hierarchically factorial structured constructs of psychopathology: a one-factor model, a two-factor model, and a bi-factor model (Brunner, Nagy, & Wilhelm, 2012). The one-factor model assumes all items measuring psychopathology are loaded on one latent factor which can be termed as general psychopathology, while a two-factor model (consistently used in prior research about the structure of psychopathology), has no function in capturing general psychopathology and instead focuses on the domain-specific factors, each of which influences a subset of the diagnostic symptoms (e.g., internalizing or externalizing problems). The bi-factor model can be considered as the combination of a one-factor and a two-factor model with an emphasis not only on domain-specific factors but also on a single underlying general psychopathology factor. Compared with one-factor and two-factor models, the bi-factor model shows a major advantage of simultaneously deconstructing the general-underlying factor for psychopathology along with domain-specific (e.g., internalizing, externalizing) factors, which also better fits a conceptualization of child psychopathology aiming to understand comorbidity (see also, Brown, 2015; for advantages of bi-factor models).

The bi-factor model has also been validated to capture the etiology of general psychopathology better than both one-factor and two-factor models in terms of providing the best model fit. This has been confirmed for children (Hankin et al., 2017; Olino, Dougherty, Bufferd, Carlson, & Klein, 2014), adolescents (Carragher et al., 2016; Laceulle, Vollebergh, & Ormel., 2015; Patalay et al., 2015; Snyder, Young, & Hankin, 2017), young adults (Lahey et al., 2017), across developmental periods, such as childhood through adolescence (Lahey et al., 2004;

Murray, Eisner, & Ribeaud, 2016), and even the entire life-span (Lahey, Krueger, Rathouz, Waldman, & Zald, 2017).

The investigation of the bi-factor structure of child psychopathology has mostly been examined by the parent and teacher reported Child Behavior Checklist (CBCL; McElroy, Belsky, Carragher, Fearon, & Patalay, 2017), which is perhaps the most commonly used measure of youth behavior problems (Achenbach & Ruffle, 2000). More recently, the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), has also been validated as a measure to capture the bi-factor structure of general psychopathology (Carragher et al., 2016; Kóbor, Takács, & Urbán, 2013; Patalay et al., 2015). Further, Deutz et al. (2018), using the same dataset as the present paper, validated the bi-factor structure of the Dysregulation Profile using the SDQ data.

2.1.2. Conceptualization of Co-occurring Problems from Person-centered Approach

To the best of my knowledge, only a few studies to date have adopted a person-centered approach to examine differentiated (heterogeneous) developmental trajectories when considering internalizing and externalizing problems together, not separately (Chen & Simons-morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Wiggins, Mitchell, Hyde, & Monk, 2015; Nivard et al., 2017;). Parallel process latent growth curve model (LGCMs), as a person-centered approach, is among the most popular approaches since it can detect heterogeneous subgroups of individuals that shared similar developmental trends with both externalizing and internalizing problems examined simultaneously (Angold, Costello, & Erkanli, 1999; Beyers & Loeber, 2003; Cramer, Waldrop, van der Maas, & Borsboom, 2010; Gilliom & Shaw, 2004). The function of the latent growth curve model is that only average within-class trajectories are estimated (i.e., means of intercept, linear and quadratic slope), and all variability within classes are constrained

to be specific. By using this approach, we can identify each participants' co-developmental trajectory and group participants with similar joint trajectories into larger groups.

Across studies, the low-risk class is characterized by initially low, stable/declining levels of internalizing symptoms and initially low, stable/declining levels of externalizing symptoms. The chronic co-occurring class is characterized by either moderate/high stability on both internalizing and externalizing problems, or a parallel developmental trend (e.g., internalizing and externalizing problems are both increasing or decreasing). These two classes have been identified, despite some variations, in studies which have examined distinct developmental periods including early to middle childhood (Fanti & Hentich, 2010; Wiggin et al., 2015), within middle childhood (Hinnant & El-Sheikh, 2013) or adolescence (Chen & Simons-Morton, 2009), and across childhood and adolescence (Nivard et al., 2017). Perhaps as a function of these developmental differences, one of the most notable variations that has emerged pertaining to the co-occurring trajectory class is the extent to which co-occurring problems are continuous (i.e., stable over time) or decreasing (e.g., Wiggins et al., 2015).

The pure-externalizing class has been characterized by moderate/high stable externalizing and low stable internalizing problems. In contrast, the pure-internalizing class, when identified, has exhibited the opposite pattern. Compared to the low-risk class, both pure-externalizing and internalizing classes had lower prevalence rate and the evidence of continuity across development was mixed. For instance, a pure-externalizing class has been identified in studies across early and middle childhood (Fanti & Henrich, 2010) and across childhood to adolescence (Nivard et al., 2017). Similarly, the pure-internalizing class also appeared to be continuous across early to middle childhood (Fanti & Henrich, 2010) and within adolescence (Hinnant & El-

Sheikh, 2013). However, a pure-internalizing class was not identified when examining the entirety of childhood and adolescence (Nivard et al., 2017).

2.2. The Current Study

The purpose of the current study is to investigate the co-development of internalizing and externalizing problems from both variable and person-centered approaches. It should be noted that the goal of the study was neither to directly compare across these two approaches nor to recommend a single approach with one ‘gold standard’. Instead, this study aims to highlight two different perspectives for measuring co-occurring internalizing and externalizing problems and assist researchers with in-depth knowledge about the various options that are available for assessing co-occurred psychopathology. In terms of deciding regarding on choice of method, it depends on how researchers’ specific objectives and what research questions are being proposed.

2.3. Method

2.3.1. Participants

Participants were first-grade school children ($M_{age}=6.75$) recruited from three different school districts in Texas as part of a large developmental study called ‘Project Achieve.’ The purpose of the project was to examine the effects of retention in elementary grades on children’s future academic achievement and socio-emotional adjustments. In order to increase the likelihood that participants would have a non-zero probability of grade retention, the research team purposefully restricted the inclusion criterion for all participating children to score below the median of a state-approved district-administered measure of literacy. Children receiving special education services, whose first language was neither English nor Spanish and children who were already retained from the first grade, were excluded. Consent and assent forms were distributed to the parents of 1,374 first grade students based on school records’ indication of

student eligibility. Schools (teachers), parents, and students were informed that the purpose of the study was to learn about factors that influence children's adjustment and success in school and were assured of the confidentiality of their responses. Parents were notified participation would include small gifts as well as an entry into a lottery to win a larger prize if consent forms were returned, regardless of whether they agreed or declined to participate. In addition, consenting participants (parents, teachers) agreed to receive \$25 for each measurement wave. Twelve-hundred (out of 1374) forms were returned and 784 parents (47% girls) agreed to participate in the study and 416 declined. Chi-square difference tests were performed on children with and without consent and showed that there were no differences on age, gender, ethnicity, socioeconomic status, nor literacy test scores (see also, Hill & Hughes, 2007). The study was approved by the Research Ethics Board of Texas A&M University.

2.3.2. Procedure

The research team followed 784 consented participants for 12 years across two cohorts during the fall of 2001 and 2002. At the start of each school year, children's primary teachers were also mailed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) to assess children in their classrooms. All the questionnaire data was completed by *different* teachers at each measurement wave. After children transitioned to middle school (5th or 6th measurement points), the questionnaires were completed by their language arts teachers or a teacher named by the language arts teacher who had more knowledge of the participants (For more details, see Hill & Hughes, 2007). Parents were also asked to fill out the mailed questionnaire.

2.4. Measures

2.4.1. Externalizing and Internalizing Problems

The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is a 25-item psychological screening tool comprising of five subscales (conduct problems, hyperactivity/inattention, emotional symptoms, peer relationship problems, and prosocial behavior). The SDQ was developed to identify child problem behavior and can be used for rapid screening of children's positive and negative attributes. The SDQ is a widely used measure of child mental health and has been shown to have good construct validity and reliability (Goodman, 1999a, 1999b; Hill & Hughes, 2007). In my study, the prosocial subscale was a priori excluded from analysis since it did not belong to either the internalizing or externalizing problems broadband scales (see Goodman & Goodman, 2010). Several studies comparing the composite score of the SDQ with the CBCL found that scores were highly correlated (Goodman & Scott, 1999; Klasen et al., 2000), and that the SDQ was significantly better in detecting inattention and hyperactivity (Goodman & Scott, 1999). According to Goodman and Goodman (2010), externalizing problems in the SDQ are represented by the composite score of the five items measuring conduct problems (e.g., often fights with others) along with the five items measuring hyperactivity/inattention (e.g., restless, fidgeting, squirming). Similarly, the composite score of the ten items measuring emotional symptoms (e.g., many worries, fears, often unhappy) and peer relationship problems (e.g., tends to play alone, picked on or bullied by others) can be used to evaluate internalizing problems. For instance, Goodman, Lamping and Ploubidis (2010) highlighted the advantages of using the broader internalizing (emotion and peer problems) and externalizing (conduct and hyperactivity/inattention problems) SDQ subscales in a low-risk sample.

To further validate the measure, we run a series of confirmatory factor analysis (CFA) and found that the ten items, corresponding to emotion problems and peer problems, however, loaded relatively poorly on one factor with the average factor loading around .63 at early childhood, 0.64 at late childhood, 0.66 at early adolescence, and 0.65 at late adolescence, and the averaged CFI across three-time points of one internalizing factor model for this ten-item set was 0.90. Hence, one single common factor may not fit well for these ten items. We then proceeded to fit a two-factor model (emotion problem factor and peer problem factor) and found a substantial improvement in model fit across the three developmental spans (averaged CFI=.96) as compared to the one factor model. The results indicated that the emotional problems and peer problems measured by their corresponding items should be considered as two distinct constructs instead of being combined as one internalizing factor. The peer problems items were not included for measuring internalizing problem in the CBCL. It is worth noting that although Goodman et al. (2010) highlighted the benefits using a broader internalizing (combining both emotion problems and peer problems) framework, they were doing so especially for the low-risk individuals. Since my sample is considered as relatively at risk for academic achievement, we removed the five items measuring peer problems and retained only those five emotion-problem related items to represent the internalizing problems, whereas the ten items corresponding to conduct problems and hyperactivity/inattention were combined to represent externalizing problems. The Cronbach's alpha of internalizing problems ranged from 0.72 to 0.78 and externalizing problems ranged from 0.88 to 0.90 across early childhood to late adolescence measurement waves.

2.5. Analysis Plan

2.5.1. Variable-centered Approach

2.5.1.1. Bi-factor Measurement Model

In the present study, instead of using the raw composite scores, we utilized a bi-factor model to account for measurement errors to represent the domain-specific internalizing and externalizing factor and the general psychopathology factor (See Figure 2-1). Compared with other factor models (e.g., one-factor or two-factor model; Figure 2-2), the bi-factor model better fits my conceptualization of child and adolescent psychopathology which contain both a general underlying construct and domain-specific constructs. Figure 2-1 depicts the bi-factor model for SDQ items, where the internalizing problem factor represents the common variance of the five items measuring emotional problems, while the externalizing problem factor represents the common variance of the ten items measuring conduct and hyperactivity problems. Finally, the general psychopathology factor captures the common variance for all fifteen items. The bi-factor model was conducted separately for the early childhood, late childhood, early adolescence, and late adolescence periods.

We tested the bi-factor measurement model in which all items loaded onto one general factor representing an underlying general construct as well as domain-specific factors. All factors were set to be orthogonal, and item residuals were not correlated. The factorial structure of the bi-factor model was evaluated by a combination of model fit indices such as chi-square value, comparative fit index (CFI), Tucker-Lewis index (TLI), the root-mean-square error of approximation (RMSEA), and Bayes Information Criteria (BIC). CFI values greater than 0.95, TLI values greater than 0.95 indicate good model fit and RMSEA scores less than 0.06 are considered good (Bollen & Curran, 2006). We also compared the bi-factor model with one-factor

and two-factor models with a series of chi-square difference tests. Secondly, the standardized factor loadings were examined to help with the understanding of item-level representation of each factor. Thirdly, to ensure that the measurement of the factorial structure was comparable across time, we performed longitudinal measurement invariance analyses. Since it is required to treat the SDQ data as categorical for employing factorial structured constructs of psychopathology, the entire analysis was performed using Mplus (Version 7.4; Muthén & Muthén, 2015) with weighted least square means and variance adjusted (WLSMV) estimator. The WLSMV estimator is appropriate for categorical data, which may not follow a multivariate normal distribution, and can produce consistent estimates of parameters if missing data are at random (our case; see also, Asparouhov & Muthen, 2010). Specifically, the *pairwise deletion* was performed for missing data with the WLSMV estimator (Muthén & Muthén, 2015).

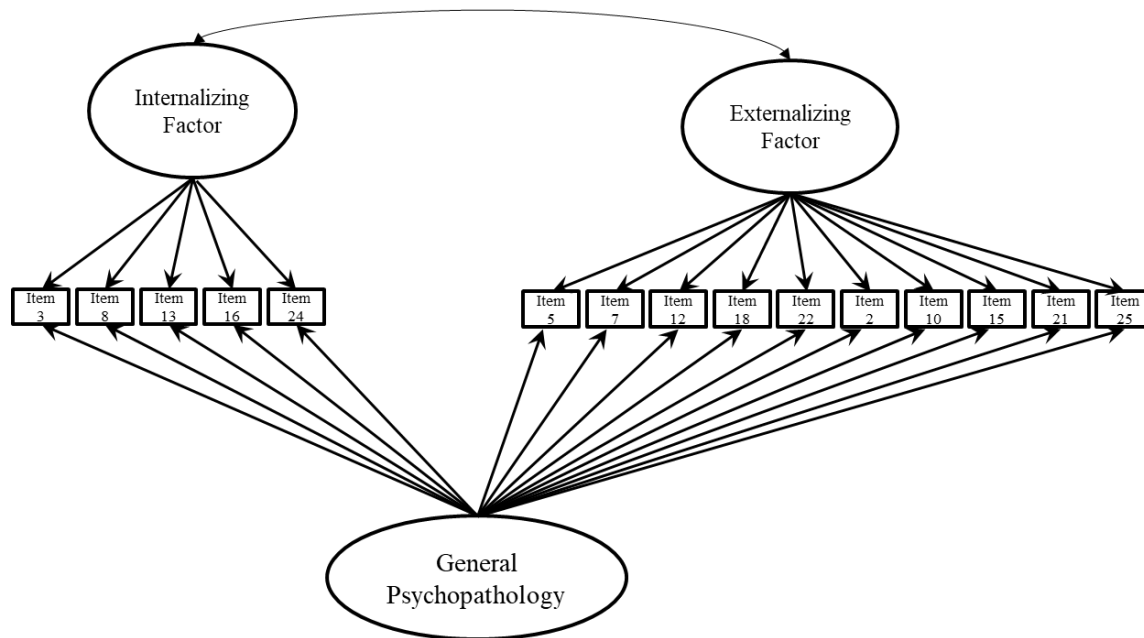


Figure 2-1. The Bi-factor Model for Representing Domain-specific Internalizing and Externalizing Factors and the General Psychopathology Factor.

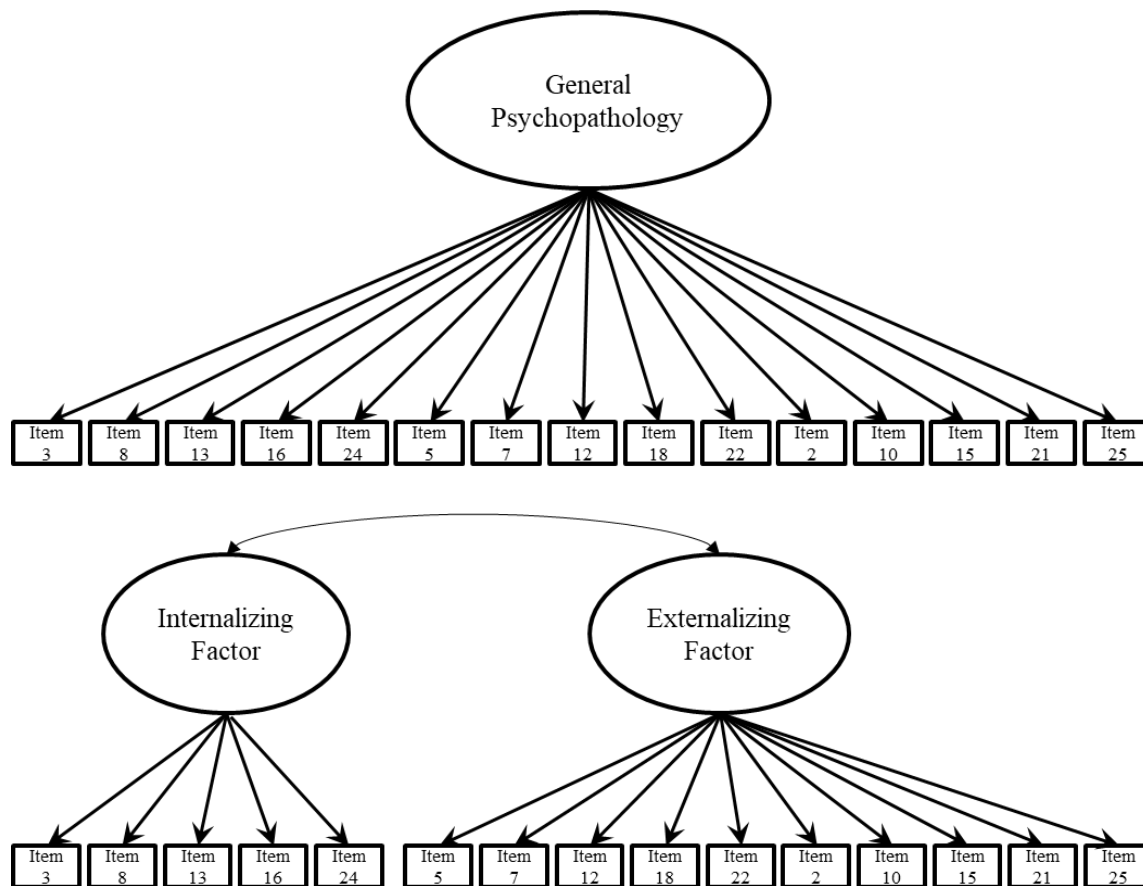


Figure 2-2. The One-factor and Two-factor Model.

2.5.2. Person-centered Approach

All analyses for the person-centered approach were performed in Mplus version 7.4 (Muthén & Muthén, 2012), using full-information maximum likelihood estimation with robust standard errors (MLR). The unconditional parallel process latent growth curve models (LGCMs) were specified to assess the joint developmental trajectories of children’s externalizing and internalizing problems using all 12 years’ data points (Muthén & Muthén, 2000). LGCMs were specified with varying numbers of classes (i.e., 2 to 6 class models), and for each model, model fit was assessed using a combination of fit indices including the Akaike information criterion

[AIC], Bayesian information criterion [BIC], sample size-adjusted Bayesian information criterion [SSABIC], the Lo-Mendel-Rubin likelihood ratio test [LMR-LRT], the bootstrap likelihood ratio test (BLRT), and entropy (Nylund, Asparouhov, & Muthén, 2007). Smaller values on the AIC, BIC, and SSABIC are indicative of a better fit model (Schwartz, 1978). A nonsignificant LMR-LRT statistic suggests that a model with one fewer class is preferred (Lo, Mendell, & Rubin; 2001). An average entropy value greater than .70 is indicative of a model with adequate classification precision. In addition to examining these fit indices, the qualitative nature of the classes was assessed to ascertain that they were conceptually meaningful and interpretable. Initially, the LCGMs were specified using a quadratic latent factor to assess non-linear growth, however, quadratic effects were consistently small and not statistically significant. Therefore, this factor was removed, and results are presented for the more parsimonious linear growth models.

2.5.3. Missing Data

Following and maintaining all participants in a longitudinal study across 12 or more years is a challenge. As highlighted in previous published work with the same dataset, Hughes et al. (2017) highlighted that the research team followed the scientific recommendations implemented a series of steps to minimize attrition and maximize participation. As with most longitudinal studies that cover multiple measurement points, not all participants had complete data at each assessment wave. We included participants from whom either parent-or teacher-reported SDQ data was available for at least one of the measurement waves from early childhood to late adolescence. At first measurement point, out of 773 children, SDQ-data were available for 678 teachers (missing 12.3%) and 496 parents (missing 35.8%). Children who had complete data for the first assessment point with teachers or parents report were compared to participants who did

not have complete data at first assessment year. Results showed that there were no differences on age, gender, ethnicity, socioeconomic status, nor literacy test scores, as tested by a Chi-square difference test. At late childhood (5th measurement point), SDQ-data were available for 541 teachers (missing 20.2%), and 432 parents (missing 12.9%). At early adolescence (8th measurement point), SDQ-data were available for 437 teachers (missing 35.5%), and 352 parents (missing 29%). At late adolescence (12th measurement point), SDQ-data were available for 390 teachers (missing 42.5%), and 281 parents (missing 43.3%). We ran a Little's Missing Completely at Random (MCAR) test using the composite main outcome SDQ scores across four measurement waves (1st, 5th, 8th, and 12th) together with all the aforementioned predictors. The MCAR test, as ran with the teacher-report, showed that the missingness was likely to be at random ($\chi^2_{347} = 369.265, p = .197$), suggesting the missingness did not depend upon any other measures or demographic characteristics involved in this study, and participants with missing data did not differ significantly from those with complete data in my study. Furthermore, a series of univariate t-test comparisons were performed with of SDQ teacher-reports in order to assess whether any causes of bias were because of missing data. First, nonsignificant t-tests indicated that missing data on the internalizing and externalizing measures were not associated with children's demographic characteristics (gender, ethnicity, socioeconomic status, and academic performance). Second, given the higher rates of attrition at late adolescence time point, additional comparisons were made to see if this attrition was associated with earlier levels of internalizing and externalizing problems. Results indicated that students who had dropped out of the study at 4th assessment point were not more likely to be high in internalizing or externalizing problems at early childhood, late childhood and early adolescence. However, the MCAR tests with parent-reported SDQ failed to reject the null hypothesis ($\chi^2_{388} = 454.515, p = .011$)

indicating that the missingness of SDQ together with our predictors are not missing at random. Considering the higher missingness rate of parent-report SDQ (missing 35.8%) compared with teacher-report (missing 12.3%) at the first measurement wave; and considering that the missingness is not at random with parent-report, we choose teacher-reported SDQ as our main informant measure. We still replicated the entire analysis with parent-reported SDQ.

2.6. Results

2.6.1. Variable-centered Approach

2.6.1.1. Bi-factor Model

2.6.1.1.1. Factor Structure

The bi-factor model fitted the SDQ data well across our four developmental periods as the comparative fit index (CFI) ranged from .975-.988, the Tucker-Lewis index (TLI) from 0.966-0.983, and the root-mean-square error of approximation (RMSEA) from .055-.072 (See Table 2-1). The Chi-square difference tests of the nested one-factor, two-factor, and bi-factor model across the developmental periods showed that the bi-factor model statistically fit the data better than the other two models with both parent and teacher reported data since the significant values indicating better fit of the less restricted model (see Table 2-1).

Table 2-1. Fit Indices of One-factor, Two-factor, and Bi-factor Models for the Parent and Teacher -reported SDQ Data across Early Childhood to Late Adolescence

Reporter	Developmental Period	Model	<i>N</i>	χ^2	<i>df</i>	<i>RMSEA</i>	<i>RMSEA 90% CI</i>	<i>CFI</i>	<i>TLI</i>	$\Delta\chi^2$
Teacher	Early Childhood	Bi-factor	678	344.693	75	0.073	[.065-.081]	0.980	0.972	
		Two-factor	678	740.509	89	0.104	[.097-.111]	0.952	0.944	2 vs. 1 (14) = 262.097, <i>p</i> < .001
		One-Factor	678	860.769	90	0.166	[.159-.173]	0.877	0.857	3 vs. 1 (15) = 860.768, <i>p</i> < .001
	Late Childhood	Bi-factor	541	286.882	75	0.072	[.064-.081]	0.979	0.971	
		Two-factor	541	698.482	89	0.113	[.105-.120]	0.94	0.929	2 vs. 1 (14) = 267.587, <i>p</i> < .001
		One-Factor	541	1387.442	90	0.163	[.156-.171]	0.872	0.851	3 vs. 1 (15) = 634.908, <i>p</i> < .001
Parent	Early Adolescence	Bi-factor	437	226.569	75	0.068	[.058-.078]	0.975	0.966	
		Two-factor	437	415.305	89	0.092	[.083-.101]	0.947	0.938	2 vs. 1 (14) = 148.294, <i>p</i> < .001
		One-Factor	437	752.857	90	0.130	[.121-.138]	0.892	0.875	3 vs. 1 (15) = 356.451, <i>p</i> < .001
	Late Adolescence	Bi-factor	390	164.019	75	0.055	[.044-.067]	0.988	0.983	
		Two-factor	390	312.453	89	0.080	[.071-.090]	0.969	0.963	2 vs. 1 (14) = 110.158, <i>p</i> < .001
		One-Factor	390	698.746	90	0.132	[.123-.141]	0.915	0.901	3 vs. 1 (15) = 360.821, <i>p</i> < .001
Teacher	Early Childhood	Bifactor	498	262.520	75	0.071	[.062-.080]	0.945	0.923	
		Two-factor	498	383.964	89	0.082	[.073-.090]	0.914	0.898	2 vs. 1 (14) = 106.200, <i>p</i> < .001
		One-Factor	498	697.866	90	0.116	[.108-.125]	0.822	0.793	2 vs. 1 (15) = 288.973, <i>p</i> < .001
	Late Childhood	Bifactor	432	221.92	75	0.067	[.057-.078]	0.954	0.935	
		Two-factor	432	344.916	89	0.082	[.073-.091]	0.920	0.905	2 vs. 1 (14) = 110.163, <i>p</i> < .001
		One-Factor	432	553.317	90	0.109	[.101-.118]	0.854	0.830	3 vs. 1 (15) = 260.734, <i>p</i> < .001
Parent	Early Adolescence	Bifactor	352	163.746	75	0.058	[.046-.070]	0.968	0.955	
		Two-factor	352	233.607	89	0.068	[.057-.079]	0.948	0.939	2 vs. 1 (14) = 64.634, <i>p</i> < .001
		One-Factor	352	314.129	90	0.084	[.074-.094]	0.919	0.906	3 vs. 2 (15) = 121.547, <i>p</i> < .001
	Late Adolescence	Bifactor	281	145.758	75	0.058	[.044-.072]	0.972	0.961	
		Two-factor	281	205.591	89	0.068	[.056-.081]	0.954	0.945	2 vs. 1 (14) = 58.579, <i>p</i> < .001
		One-Factor	281	305.741	90	0.092	[.081-.104]	0.914	0.900	3 vs. 2 (15) = 132.553, <i>p</i> < .001

2.6.1.1.2. Measurement Invariance Across Time

The measurement invariance analyses with our best fitted bi-factor model (i.e., examining Configural versus Scalar invariance) were performed across the four distinct developmental periods using manual procedures of testing measurement invariance with categorical indicators using WLSMV estimation and Delta parametrization (Muthén & Muthén, 2015). The configural invariance model was the least restrictive model (factor means and scale factors were fixed to zero, but factor loadings and thresholds were freely estimated) through testing whether or not the same items measured our latent factors across time. The scalar invariance model was the most restricted model (scale factors and factor mean were fixed at zero at a one-time period, but free in a different time period). The standards steps for testing measurement invariance also included testing of the metric invariance model after the configural but before the scalar invariance models. The testing of the metric model separately, however, was not specifically needed in our case since the metric of the latent factor variances (i.e., domain-specific internalizing and externalizing factors and general psychopathology factors) were already being fixed to 1 in our bi-factor model (see Mplus User Guide version 7 page 486, or version 8 page 544). The scalar invariance model can be considered as the combination of configural invariance (constructs being measure by the same items across time) and metric invariance (factor loadings of those items must be equivalent across time) models. In addition, the scalar model was examined by mean comparisons across time, requiring that the item intercepts were also equivalent across time. The result of longitudinal measurement invariance analyses of the bi-factor model across four-time points showed that there was scalar measurement invariance across three developmental time points as indicated by the values of Δ RMSEA and Δ CFI (See Table 2-2), which further validated the bi-factor model in my study.

Table 2-2. Measurement Invariance of the Bi-factor Model with Teacher and Parent-Reported SDQ Data

<i>Reporter</i>	<i>Developmental periods</i>	<i>Model</i>	<i>N</i>	χ^2	<i>df</i>	<i>RMSEA</i>	<i>RMSEA 90% CI</i>	<i>CFI</i>	<i>TLI</i>	Δdf	ΔCFI	$\Delta RMSEA$
Teacher-Report	Late Childhood –	Model 1: Configural Invariance	619	559.315	357	0.030	[.025-.035]	0.99	0.98			
	Early Adolescence	Model 2: Scalar Invariance	619	579.962	384	0.029	[.024-.033]	0.99	0.98	27	0.000	0.001
	Late Childhood –	Model 1: Configural Invariance	609	535.565	357	0.029	[.024-.034]	0.99	0.98			
	Late Adolescence	Model 2: Scalar Invariance	609	575.955	384	0.029	[.024-.033]	0.99	0.98	27	0.001	0.000
	Early Adolescence –	Model 1: Configural Invariance	511	1029.55	682	0.029	[.025-.032]	0.98	0.97			
	Late Adolescence	Model 2: Scalar Invariance	511	1102.18	719	0.030	[.026-.033]	0.97	0.97	37	0.002	0.001
Parent-Report	Late Childhood –	Model 1: Configural Invariance	477	594.375	357	0.037	[.032-.043]	0.96	0.95			
	Early Adolescence	Model 2: Scalar Invariance	477	620.616	384	0.036	[.031-.041]	0.96	0.96	27	0.000	0.001
	Late Childhood –	Model 1: Configural Invariance	473	518.63	357	0.031	[.025-.037]	0.97	0.96			
	Late Adolescence	Model 2: Scalar Invariance	473	953.744	719	0.026	[.022-.031]	0.96	0.96	37	0.005	0.002
	Early Adolescence –	Model 1: Configural Invariance	390	913.791	682	0.029	[.024-.034]	0.96	0.95			
	Late Adolescence	Model 2: Scalar Invariance	390	948.253	719	0.028	[.023-.033]	0.96	0.96	37	0.001	0.001

2.6.1.1.3. Factor Loadings

Table 2-3 shows the detailed standardized factor loadings of the bi-factor model with SDQ data. Examination of the factor loadings will offer a clear insight into what the domain-specific internalizing and externalizing factors, and general psychopathology factor stand for. Since scalar measurement invariance was identified in the bi-factor model across four developmental periods, we will not specifically discuss the differences of factor loadings across four developmental spans.

In my study, all 15 items' factor loadings on the GP-factor were moderate to high and statistically significant ($p < .05$) with an average factor loading around 0.7. The ten items for externalizing problems loaded mostly non-significant on the lower level domain-specific externalizing factor, but extremely high on the general psychopathology factor ($M_{FL} = .8$). This suggests that both conduct problems and hyperactivity/inattention problems more directly describe the general psychopathology rather than the domain-specific symptoms. By contrast, the five items for internalizing problems loaded adequately well on both domain-specific ($M_{FL} = .5$) and the general factor ($M_{FL} = .4$). Specifically, two items 'many worries' and 'many fears, easily scared' loaded very high ($M_{FL} = .8$) on the domain-specific Internalizing Factor, but relatively low on the general factor ($M_{FL} = .3$) indicating these two items more directly describe the domain-specific internalizing symptoms, rather than the general psychopathology.

Table 2-3. Fully Standardized Item Loadings from Bi-factor Models of Parent and Teacher SDQs

Items	Early Childhood (T1)						Late Childhood (T5)					
	Internalizing symptoms		Externalizing symptoms		General Problems		Internalizing symptoms		Externalizing symptoms		General Problems	
	T	P	T	P	T	P	T	P	T	P	T	P
Often complains of headaches	0.41	0.52			0.23	0.24	0.47	0.37			0.45	0.35
Many worries	0.8	0.65			0.18	0.34	0.82	0.59			0.23	0.38
Often unhappy, downhearted	0.64	0.56			0.48	0.5	0.59	0.6			0.5	0.57
Nervous or clingy in new situations	0.62	0.47			0.32	0.47	0.68	0.52			0.35	0.48
Many fears, easily scared	0.83	0.65			0.2	0.38	0.9	0.63			0.21	0.31
Often has temper tantrums or hot tempers			-0.18	-0.03	0.76	0.62			-0.33	-0.19	0.76	0.69
Generally obedient (R)			0.02	0.36	0.87	0.46			-0.19	0.03	0.83	0.63
Often fights with other children			-0.24	-0.03	0.86	0.74			-0.37	-0.28	0.79	0.68
Often lies or cheats			-0.25	-0.11	0.8	0.75			-0.4	-0.3	0.81	0.76
Steals from home, school or elsewhere			-0.38	-0.31	0.77	0.78			-0.51	-0.46	0.74	0.82
Restless, overactive			0.5	0.35	0.81	0.72			0.39	0.35	0.86	0.71
Constantly fidgeting or squirming			0.54	0.35	0.79	0.74			0.45	0.41	0.84	0.78
Easily distracted, concentration wanders			0.45	0.42	0.73	0.69			0.32	0.39	0.81	0.66
Thinks things out before acting (R)			0.19	0.57	0.75	0.38			-0.08	0.22	0.79	0.58
Sees tasks through to the end (R)			0.39	0.68	0.74	0.49			0.23	0.36	0.85	0.61

Table 2-3 Continued. Fully Standardized Item Loadings from Bi-factor Models of Parent and Teacher SDQs

Items	Early Adolescence (T8)						Late Adolescence (T12)					
	Internalizing symptoms		Externalizing symptoms		General Problems		Internalizing symptoms		Externalizing symptoms		General Problems	
	T	P	T	P	T	P	T	P	T	P	T	P
Often complains of headaches	0.5	0.37			0.45	0.5	0.67	0.35			0.44	0.5
Many worries	0.77	0.55			0.29	0.52	0.81	0.56			0.34	0.53
Often unhappy, downhearted	0.62	0.45			0.43	0.57	0.67	0.54			0.4	0.65
Nervous or clingy in new situations	0.68	0.37			0.41	0.45	0.54	0.53			0.46	0.56
Many fears, easily scared	0.82	0.55			0.29	0.52	0.8	0.6			0.24	0.48
Often has temper tantrums or hot tempers			0.41	-0.1	0.8	0.72			-0.11	0.18	0.87	0.68
Generally obedient (R)			0.17	-0.03	0.83	0.68			-0.07	0.33	0.86	0.65
Often fights with other children			0.39	-0.18	0.82	0.82			-0.2	0.44	0.9	0.55
Often lies or cheats			0.21	-0.28	0.81	0.76			0.03	0.4	0.89	0.76
Steals from home, school or elsewhere			0.24	-0.32	0.65	0.69			-0.24	0.5	0.73	0.54
Restless, overactive			-0.43	0.29	0.81	0.77			0.57	-0.21	0.76	0.86
Constantly fidgeting or squirming			-0.53	0.34	0.8	0.73			0.72	-0.34	0.67	0.8
Easily distracted, concentration wanders			-0.3	0.43	0.79	0.7			0.36	-0.28	0.82	0.82
Thinks things out before acting (R)			0.12	0.14	0.78	0.65			0.1	0.23	0.79	0.7
Sees tasks through to the end (R)			-0.02	0.44	0.86	0.68			0.24	-0.01	0.87	0.67

Note. Significant factor loadings are in **bold**.

2.6.2. Person-centered Approach

As shown in Figure 2-3, we identified four distinct co-development trajectories namely as the chronic co-occurring (30.1%), moderate co-occurring (28.5%), pure-externalizing (18.6%), and low-risk classes (22.8%). The chronic co-occurring class exhibited the highest levels of externalizing and internalizing problems ($I_{ext} = 1.098, p < .001; S_{ext} = -.038, p < .001; I_{int} = .617, p < .001; S_{int} = -.027, p < .001$). The moderate co-occurring class exhibited moderate levels of externalizing and internalizing problems ($I_{ext} = .365, p < .001; S_{ext} = -.009, p = .064; I_{int} = .459, p < .001; S_{int} = -.025, p < .001$). The pure-externalizing class exhibited high externalizing problems and low levels of internalizing problems ($I_{ext} = .747, p < .001; S_{ext} = -.017, p < .05; I_{int} = .193, p < .001; S_{int} = -.010, p < .001$). The low-risk class consisted of children with low levels of externalizing and internalizing problems ($I_{ext} = .172, p < .001; S_{ext} = .001, p = .867; I_{int} = .143, p < .001; S_{int} = -.008, p < .003$).

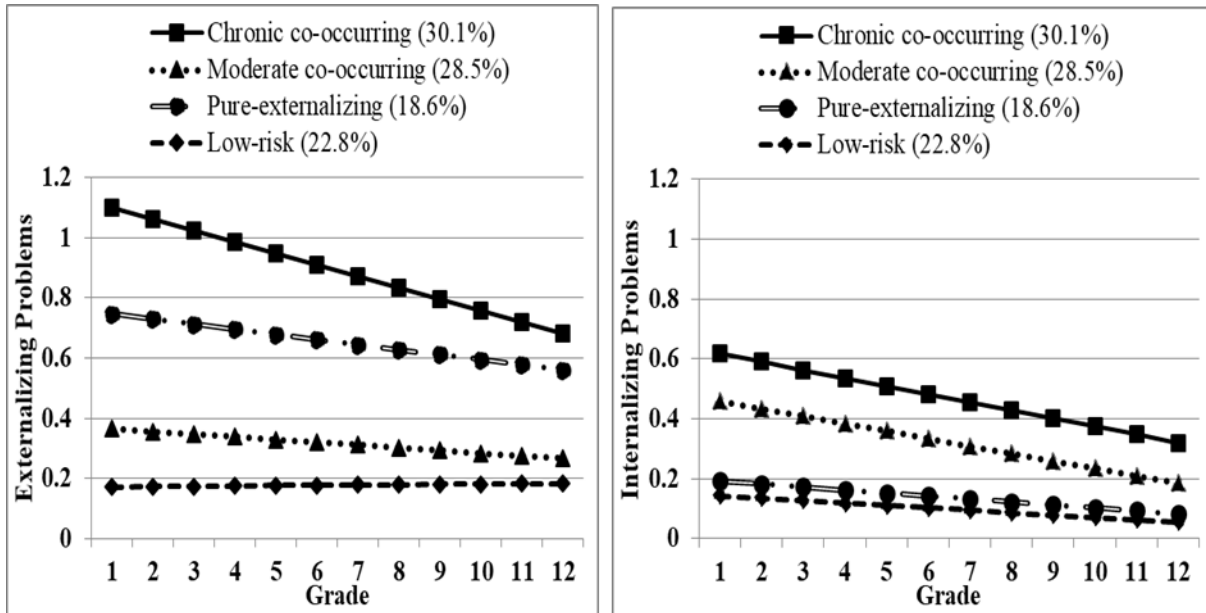


Figure 2-3. Joint Trajectory Model Examining the Co-development of Externalizing and Internalizing Problems from Grades 1 to 12

2.7. Discussion

The objective of this study was to evaluate the co-occurred internalizing and externalizing problems from both the variable and person-centered approach. For the variable-centered approach, of the one-factor, two-factor model, and a bi-factor model, the bifactor structure of SDQ yielded the closest fit to data (irrespective of the source of informants), with a general psychopathology factor underlying both externalizing and internalizing psychopathology that exists next to domain-specific factors of internalizing and externalizing problems. The person-centered latent parallel growth model revealed four distinct groups of children with different trajectories: (a) chronic co-occurring, (b) moderate co-occurring, (c) pure-externalizing, and (d) low-risk.

2.7.1. Variable-centered Approach

2.7.1.1. Factor Loadings

The general psychopathology factor was clearly and well described by the bi-factor model. A closer look at the item-level factor loadings in my model revealed that all items examining externalizing problems loaded very well on the GP-factor, but many loaded poorly on the domain-specific externalizing factor. This finding was consistent with Kóbor et al. (2013) as they also found “difficulties concerning hyperactive-impulsive behavior and conduct disorder are the most important or salient when a child’s behavior is being evaluated (pp. 305).” This pattern was not found for the internalizing problems items that loaded well on both the GP-factor and the domain-specific internalizing factor. More importantly, we identified two items ‘many worries’ and ‘many fear, easily scared,’ which better captured the domain-specific Internalizing Factor than the GP-factor. A similar finding was also reported in Olino et al. (2014) in preschool-aged

children. In that study, the internalizing factor (modeled via a bi-factor model) was positively associated with an elevated level of fear.

When comparing the factor loadings of the bi-factor model to the one and two-factor models, we can first identify the existence of a GP-factor, which indicate the severity of day-to-day internalizing and externalizing problem reported by teachers can be captured by a general dimension; and secondly, validate the importance of considering the co-occurrence in both treatment and prevention application scenarios since the internalizing and externalizing problems are co-occurred most of the time. My study concluded that both childhood and adolescence behavior problems are best described by a bi-factor model, which means that the measured construct has both dominant global factors and specific components that indicate multidimensionality.

2.7.2. Person-centered Approach

The four trajectory classes we identified were consistent with those previously reported in prior studies that have used similar methods (see Chen & Simons-morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Nivard et al., 2017; Wiggins et al., 2015). As hypothesized, the chronic co-occurring class was characterized by persistently higher levels of internalizing and externalizing problems compared to other classes. The identification of this class is consistent with extant studies which have focused on varying developmental periods including early to middle childhood (ages 2 to 12; Fanti & Hentich, 2010; ages 3 to 9; Wiggin et al., 2015), middle childhood (ages 8 to 11; Hinnant & El-Sheikh, 2013), adolescence (grades 6 to 9; Chen & Simons-Morton, 2009), and across childhood and adolescence (ages 7 to 15; Nivard et al., 2017).

Taken together, these findings indicate that chronic co-occurring problems are exhibited across varying development periods and that their onset occurs in early childhood. However, in contrast to studies which have examined relatively shorter developmental periods and typically reported greater stability in this trajectory class, my findings suggest that children in this class may exhibit a simultaneous decline in their rates of externalizing and internalizing problems across childhood and adolescence (although they still maintained higher levels of problem behaviors in late adolescence compared to other classes). The high prevalence of children identified in this class (about 30% of our sample) suggests that chronic co-occurring problem behaviors may reflect a lasting and persistent difficulty for a substantial number of children across the entire formal schooling years. Notably, compared to other studies which have reported that the prevalence of children with chronic co-occurring problems ranges from around 2% to 10%, the prevalence of children identified in the current study was relatively higher. This high prevalence may be reflective of a sample of children who not only exhibited early vulnerabilities characterized by low family income and academic risks, but also greater rates of behavioral problems. However, because studies have used varying measures to assess problem behaviors, the differences in prevalence rates reported across studies could also be due to methodological (as opposed to sampling) differences.

In addition to children who exhibited more severe and persistent levels of problem behaviors, a second class was identified which exhibited "moderate co-occurring" problems, such that they had moderate levels of externalizing and internalizing problems. Although this class was not initially hypothesized, a comparable class of children was identified by Fanti and Hentrich (2010) who reported that about 15.1% of children were in this trajectory class from

early to middle childhood (ages 2 to 12). Thus, for some children, moderate co-occurring problem behaviors exhibit an onset in early childhood and persist through adolescence.

In contrast to children who exhibited co-occurring problem behaviors, the "pure-externalizing" class exhibited high externalizing problems in combination with low levels of internalizing problems. For the most part, the nature of this class was consistent with other investigations which have examined varying developmental periods including early and middle childhood (Fanti & Henrich, 2010) and across childhood to adolescence (Nivard et al., 2017). For instance, Fanti and Henrich (2010) identified three classes which were characterized primarily by externalizing problems: one which exhibited chronic externalizing problems and low internalizing problems (1.9%) a second with chronic externalizing, but moderate internalizing problems (3.2%), and a third with moderate-externalizing problems and low internalizing problems (7.4%). Similarly, Nivard et al. (2017) identified a high-stable externalizing group who exhibited decreasing internalizing problems.

Contrary to expectations, a pure-internalizing class was not identified. In light of my findings, and those reported by other investigators, it appears that there may be a low prevalence of children who exhibit early-onset internalizing problems without also engaging in externalizing behaviors. For instance, focusing on a sample in early childhood, Fanti and Henrich (2010) identified a very small proportion of children (2.3%) with a pure-internalizing trajectory, but a relatively larger proportion (12.6%) belonged to a high-internalizing and high-desisting externalizing group. Examining a sample during the childhood years (i.e., ages 8 to 11), Hinnant and El-Sheikh (2013) identified a relatively large percentage of children (41%) who exhibited low externalizing and moderate internalizing behaviors, trajectory trajectories, however, a high-internalizing class was not identified. Examining a sample in late childhood and adolescence,

Nivard and colleagues (2017) identified an adolescent-onset pure-internalizing class, but not a stable pure-internalizing across childhood and adolescence. Notably, studies that have examined internalizing problems independently of externalizing problems also reveal some inconsistencies with respect to the identification of a chronic-high internalizing class. Although some studies have identified this class across different periods in childhood and adolescence (see Fanti & Henrich, 2010; Klein et al., 2019; Nantel-Vivier, Pihl, Côté, S., & Tremblay, 2014; Weeks et al., 2014; Whalen et al., 2016), other studies have reported contradictory findings (Côté et al., 2009; Davis, Votruba-Drzal, & Silk, 2015; Dekker et al., 2007; Sterba et al., 2007). Some of the inconsistent findings reported across studies may also relate to methodological differences, and in particular, how internalizing problems are measured. For instance, it is possible that studies which have relied on parent reports (e.g., Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Nivard et al., 2017) are more sensitive at identifying certain internalizing symptoms which may be more easily overlooked by teacher-reports, particularly in adolescence when teachers have fewer opportunities to interact with students on a one-on-one basis. Considering this explanation, an important direction for future research may be to evaluate further potential variations in the identification of co-occurring trajectories based on multiple informants.

2.7.3. Limitations

The current study also has several limitations. The first limitation was the attrition rate, which could restrict the generalizability of my findings. Having large proportions of missing data ranging from 20-70% is not uncommon in longitudinal studies, particularly when participants are followed up after a decade. Though not reported in this study, multiple imputation techniques were applied for addressing missingness with both parent and teacher data and the result patterns were primarily similar to what has been reported in the current study. The

second limitation of the current study involved generalizability, which is that my sample consisted of children at risk for reading problems in early childhood, which may hinder the generalizable power to normal and healthy community samples. It should be mentioned that although the participants were at risk for reading problems, they did not have clinical levels of reading problems (their averaged age-normed standardized reading score was a little bit lower than the mean). Hence, we still consider my sample as an at risk-nonclinical-community sample, though the generalizability of the results of the current study may be affected.

2.7.4. Conclusion

My study consolidates the notion that internalizing and externalizing problems co-occur at higher rates than to be expected by chance from both variable and person-centered approach. As such, this data support the idea that internalizing and externalizing problems may manifest as different forms of psychopathology, but largely share a common underlying etiology. It is important that we know how to we can measure such co-occurrence of different forms of psychopathology to ultimately better understand the nature of co-occurring psychopathology patterns and how interventions targeting specific self-regulation/executive functions skills might influence internalizing, externalizing, and general psychopathology.

2.8. References

Achenbach, T. M., & Edelbrock, C. S. (1978). The classification of child psychopathology: a review and analysis of empirical efforts. *Psychological Bulletin*, *85*, 1275–1301

Achenbach, T. M., & Ruffle, T. M. (2000). The Child Behavior Checklist and related forms for assessing behavioral/emotional problems and competencies. *Pediatrics in Review*, *21*, 265–271.

- Allman, K. L., & Slate, J. R. (2011). School discipline in public education: A brief review of current practices. *International Journal of Educational Leadership Preparation*, 6(2), n2.
- Angold, A., Costello, E. J., & Erkanli, A. (1999). Comorbidity. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, 40, 57–87.
- Asparouhov, T., & Muthén, B. (2010). Weighted least squares estimation with missing data. Mplus Technical Appendix, 1–10. Retrieved from <http://www.statmodel.com/download/GstrucMissingRevision.pdf>
- Beyers, J. M., & Loeber, R. (2003). Untangling developmental relations between depressed mood and delinquency in male adolescents. *Journal of abnormal child psychology*, 31, 247–266.
- Bollen K. A., Curran P. J. (2006). *Latent curve models: A structural equation approach*. New York, NY: Wiley.
- Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. New York, NY: The Guilford Press.
- Brunner, M., Nagy, G., & Wilhelm, O. (2012). A tutorial on hierarchically structured constructs. *Journal of personality*, 80, 796–846.
- Carragher, N., Teesson, M., Sunderland, M., Newton, N. C., Krueger, R. F., Conrod, P. J., ... & Slade, T. (2016). The structure of adolescent psychopathology: a symptom-level analysis. *Psychological Medicine*, 46, 981–994.
- Caspi, A., & Moffitt, T. E. (2018). All for one and one for all: Mental disorders in one dimension. *American Journal of Psychiatry*, 175, 831–844.
- Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., Meier, M., Ramrakha, S., Shalev, I., Poulton, R. & Moffitt, T. E. (2014). The p factor one

general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science*, 2, 119–137.

Center for Behavioral Health Statistics and Quality. (2015). Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health (HHS Publication No. SMA 15-4927, NSDUH Series H-50). Retrieved from <http://www.samhsa.gov/data/>

Chen, R., & Simons–Morton, B. (2009). Concurrent changes in conduct problems and depressive symptoms in early adolescents: A developmental person–centered approach. *Development and Psychopathology*, 21, 285–307.

Cosgrove, V. E., Rhee, S. H., Gelhorn, H. L., Boeldt, D., Corley, R. C., Ehringer, M. A., ... & Hewitt, J. K. (2011). Structure and etiology of co-occurring internalizing and externalizing disorders in adolescents. *Journal of Abnormal Child Psychology*, 39, 109–123.

Côté, S. M., Boivin, M., Liu, X., Nagin, D. S., Zoccolillo, M., & Tremblay, R. E. (2009). Depression and anxiety symptoms: Onset, developmental course and risk factors during early childhood. *Journal of Child Psychology and Psychiatry*, 50, 1201–1208.

Cramer, A. O., Waldrop, L. J., van der Maas, H.L.J., & Borsboom, D. (2010). Comorbidity: A network perspective. *Behavioral and Brain Sciences*, 33, 137–150.

Davis, S., Votruba-Drzal, E., & Silk, J. S. (2015). Trajectories of internalizing symptoms from early childhood to adolescence: Associations with temperament and parenting. *Social Development*, 24, 501–520.

Dekker, M. C., Ferdinand, R. F., van Lang, N. D., Bongers, I. L., van der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood to

- late adolescence: Gender differences and adult outcome. *Journal of Child Psychology and Psychiatry*, 48, 657–666.
- Deutz, M., Shi, Q., Vossen, H., Huijding, J., Prinzie, P., Dekovic, M., Van Baar, A., & Woltering, S. (2018). Evaluation of the Strengths and Difficulties Questionnaire-Dysregulation Profile (SDQ-DP). *Psychological Assessment*, 30, 1174–1185.
- Fanti, K. A., & Henrich, C. C. (2010). Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: findings from the National Institute of Child Health and Human Development Study of Early Child Care. *Developmental Psychology*, 46, 1159–1175.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 39–50.
- Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology*, 16, 313–333.
- Goodman, A., & Goodman, R. (2011). Population mean scores predict child mental disorder rates: validating SDQ prevalence estimators in Britain. *Journal of Child Psychology and Psychiatry*, 52, 100–108.
- Goodman, A., Lamping, D. L., & Ploubidis, G. B. (2010). When to use broader internalizing and externalizing subscales instead of the hypothesized five subscales on the Strengths and Difficulties Questionnaire (SDQ): data from British parents, teachers and children. *Journal of Abnormal Child Psychology*, 38, 1179–1191.
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry*, 38, 581–586.

- Goodman, R. (1999). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 1337–1345.
- Goodman, R. (1999). The extended version of the Strengths and Difficulties Questionnaire as a guide to child psychiatric caseness and consequent burden. *The Journal of Child Psychology and Psychiatry and Allied Disciplines, 40*, 791–799.
- Goodman, R., & Scott, S. (1999). Comparing the Strengths and Difficulties Questionnaire and the Child Behavior Checklist: is small beautiful? *Journal of Abnormal Child Psychology, 27*, 17–24.
- Hankin, B. L., Davis, E. P., Snyder, H., Young, J. F., Glynn, L. M., & Sandman, C. A. (2017). Temperament factors and dimensional, latent bi-factor models of child psychopathology: Transdiagnostic and specific associations in two youth samples. *Psychiatry Research, 252*, 139–146.
- Hill, C. R., & Hughes, J. N. (2007). An examination of the convergent and discriminant validity of the Strengths and Difficulties Questionnaire. *School Psychology Quarterly, 22*, 380–406.
- Hinnant, J. B., & El-Sheikh, M. (2013). Codevelopment of externalizing and internalizing symptoms in middle to late childhood: Sex, baseline respiratory sinus arrhythmia, and respiratory sinus arrhythmia reactivity as predictors. *Development and Psychopathology, 25*, 419–436.
- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*, 617–627.

- Klasen, H., Woerner, W., Wolke, D., Meyer, R., Overmeyer, S., Kaschnitz, W., ... & Goodman, R. (2000). Comparing the German versions of the strengths and difficulties questionnaire (SDQ-Deu) and the child behavior checklist. *European Child & Adolescent Psychiatry, 9*, 271–276.
- Klein, A. M., Schlesier-Michel, A., Otto, Y., White, L. O., Andreas, A., Sierau, S., ... & von Klitzing, K. (2019). Latent trajectories of internalizing symptoms from preschool to school age: A multi-informant study in a high-risk sample. *Development and Psychopathology, 31*, 657–681.
- Kóbor, A., Takács, Á., & Urbán, R. (2013). The bi-factor model of the Strengths and Difficulties Questionnaire. *European Journal of Psychological Assessment, 29*, 299–307.
- Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... & Eaton, N. R. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology, 126*, 454–477.
- Krueger, R. F., & DeYoung, C. G. (2016). The RDoC initiative and the structure of psychopathology. *Psychophysiology, 53*, 351–354.
- Krueger, R. F., & Markon, K. E. (2006). Reinterpreting comorbidity: a model-based approach to understanding and classifying psychopathology. *Annual Review of Clinical Psychology, 2*, 111–133.
- Krueger, R. F., & Markon, K. E. (2011). A dimensional-spectrum model of psychopathology: Progress and opportunities. *Archives of General Psychiatry, 68*, 10–11.

- Krueger, R. F., & Piasecki, T. M. (2002). Toward a dimensional and psychometrically-informed approach to conceptualizing psychopathology. *Behaviour Research and Therapy*, 40, 485–499.
- Laceulle, O. M., Vollebergh, W. A., & Ormel, J. (2015). The structure of psychopathology in adolescence: replication of a general psychopathology factor in the TRAILS study. *Clinical Psychological Science*, 3, 850–860.
- Lahey, B. B., Applegate, B., Hakes, J. K., Zald, D. H., Hariri, A. R., & Rathouz, P. J. (2012). Is there a general factor of prevalent psychopathology during adulthood? *Journal of Abnormal Psychology*, 121, 971–977.
- Lahey, B. B., Applegate, B., Waldman, I. D., Loft, J. D., Hankin, B. L., & Rick, J. (2004). The structure of child and adolescent psychopathology: generating new hypotheses. *Journal of Abnormal Psychology*, 113, 358–385.
- Lahey, B. B., Krueger, R. F., Rathouz, P. J., Waldman, I. D., & Zald, D. H. (2017). A hierarchical causal taxonomy of psychopathology across the life span. *Psychological Bulletin*, 143, 142–186.
- Lahey, B. B., Zald, D. H., Perkins, S. F., Villalta-Gil, V., Werts, K. B., Van Hulle, C. A., ... Poore, H. E. (2017). Measuring the hierarchical general factor model of psychopathology in young adults. *International Journal of Methods in Psychiatric Research*, 27, e1593.
- Leadbeater, B. J., Kuperminc, G. P., Blatt, S. J., & Hertzog, C. (1999). A multivariate model of gender differences in adolescents' internalizing and externalizing problems. *Developmental Psychology*, 35, 1268–1282.
- Levit, K. R., Kassed, C. A., Coffey, R. M., Mark, T. L., McKusick, M. D. R., King, E. C., ... & Stranges, E. (2008). Projections of national expenditures for mental health services and

- substance abuse treatment. *Substance Abuse and Mental Health Services Administration*. Retrieved from:
http://www.choopersguide.com/custom/domain_1/extra_files/attach_1_8.pdf
- Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika*, *88*, 767–778.
- McElroy, E., Belsky, J., Carragher, N., Fearon, P., & Patalay, P. (2018). Developmental stability of general and specific factors of psychopathology from early childhood to adolescence: dynamic mutualism or p-differentiation?. *Journal of Child Psychology and Psychiatry*, *59*, 667–675.
- Murray, A. L., Eisner, M., & Ribeaud, D. (2016). The development of the general factor of psychopathology ‘p factor’ through childhood and adolescence. *Journal of Abnormal Child Psychology*, *44*, 1573–1586.
- Muthén, B., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research*, *24*, 882–891.
- Muthén, L. K., & Muthén, B. O. (2012). MPlus: statistical analysis with latent variables--User's guide. Retrieved from: https://www.statmodel.com/html_ug.shtml
- Muthén, L. K., & Muthén, B. O. (2015). *Mplus: Statistical analysis with latent variables: User's guide*. Los Angeles, CA: Muthén & Muthén.
- Nantel-Vivier, A., Pihl, R. O., Côté, S., & Tremblay, R. E. (2014). Developmental association of prosocial behaviour with aggression, anxiety and depression from infancy to preadolescence. *Journal of Child Psychology and Psychiatry*, *55*, 1135–1144.

- Newman, D. L., Moffitt, T. E., Caspi, A., & Silva, P. A. (1998). Comorbid mental disorders: implications for treatment and sample selection. *Journal of Abnormal Psychology, 107*, 305–311.
- Nivard, M. G., Lubke, G. H., Dolan, C. V., Evans, D. M., Pourcain, B. S., Munafò, M. R., & Middeldorp, C. M. (2017). Joint developmental trajectories of internalizing and externalizing disorders between childhood and adolescence. *Development and Psychopathology, 29*, 919–928.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 535–569.
- Olino, T. M., Dougherty, L. R., Bufferd, S. J., Carlson, G. A., & Klein, D. N. (2014). Testing models of psychopathology in preschool-aged children using a structured interview-based assessment. *Journal of Abnormal Child Psychology, 42*, 1201–1211.
- Patalay, P., Fonagy, P., Deighton, J., Belsky, J., Vostanis, P., & Wolpert, M. (2015). A general psychopathology factor in early adolescence. *The British Journal of Psychiatry, 207*, 15–22.
- Rivenbark, J. G., Odgers, C. L., Caspi, A., Harrington, H., Hogan, S., Houts, R. M., ... & Moffitt, T. E. (2018). The high societal costs of childhood conduct problems: evidence from administrative records up to age 38 in a longitudinal birth cohort. *Journal of Child Psychology and Psychiatry, 59*, 703–710.
- Schwartz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics, 6*, 461–464.

- Snyder, H. R., Young, J. F., & Hankin, B. L. (2017). Strong homotypic continuity in common psychopathology-, internalizing-, and externalizing-specific factors over time in adolescents. *Clinical Psychological Science, 5*, 98–110.
- Sterba, S. K., Prinstein, M. J., & Cox, M. J. (2007). Trajectories of internalizing problems across childhood: Heterogeneity, external validity, and gender differences. *Development and Psychopathology, 19*, 345–366.
- Tackett, J. L., Lahey, B. B., Van Hulle, C., Waldman, I., Krueger, R. F., & Rathouz, P. J. (2013). Common genetic influences on negative emotionality and a general psychopathology factor in childhood and adolescence. *Journal of Abnormal Psychology, 122*, 1142–1153.
- Weeks, M., Cairney, J., Wild, T. C., Ploubidis, G. B., Naicker, K., & Colman, I. (2014). Early-life predictors of internalizing symptom trajectories in Canadian children. *Depression and Anxiety, 31*, 608–616.
- Whalen, D. J., Luby, J. L., Tilman, R., Mike, A., Barch, D., & Belden, A. C. (2016). Latent class profiles of depressive symptoms from early to middle childhood: predictors, outcomes, and gender effects. *Journal of Child Psychology and Psychiatry, 57*, 794–804.
- Wiggins, J. L., Mitchell, C., Hyde, L. W., & Monk, C. S. (2015). Identifying early pathways of risk and resilience: The codevelopment of internalizing and externalizing symptoms and the role of harsh parenting. *Development and Psychopathology, 27*, 1295–1312.

3. TRAJECTORIES OF PURE AND CO-OCCURRING INTERNALIZING AND EXTERNALIZING PROBLEMS FROM EARLY CHILDHOOD TO ADOLESCENCE: ASSOCIATIONS WITH EARLY CHILDHOOD INDIVIDUAL AND CONTEXTUAL ANTECEDENTS*

3.1. Introduction

A growing body of evidence supports the viewpoint that internalizing (i.e., social withdrawal, anxiety, depression, and psychosomatic reactions) and externalizing (i.e., conduct problems, aggression, and attention difficulties) problems are continuous rather than categorical, and that different forms of problem behaviors often co-occur (Achenbach, Ivanova, Rescorla, Turner, & Althoff, 2016; Caspi & Moffitt, 2018). Indeed, moderate correlations between internalizing and externalizing problems have been consistently documented in childhood and adolescence (Gilliom & Shaw, 2004). Co-occurring problems have also been associated with unique outcomes and etiologies. Compared to children and adolescents with either externalizing *or* internalizing problems, those with co-occurring problems are more likely to experience other mental health problems such as substance abuse, addiction and eating disorders, suffer from greater functional interference, and exhibit lower academic performance (Achenbach et al., 2016; Oland & Shaw, 2005). Underlying these empirical findings are multiple theoretical perspectives and frameworks which highlight the importance of considering the co-occurrence of problem behaviors, and which propose that internalizing and externalizing behaviors often develop in

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conjunction with one another (see Caspi & Moffitt, 2018; Keiley, Bates, Dodge, & Pettit, 2000; Lee & Bukowski, 2012; Woltering & Shi, 2016).

There is also considerable evidence indicating that children who face early adversities, including family socioeconomic adversity as well as being academically at-risk, are at greater risk for exhibiting maladaptive trajectories of internalizing and externalizing problems (Hanson et al., 2017). Moreover, when adversity comes in multiple forms (e.g., both low language ability and high family adversity), its effects are more debilitating since children are particularly sensitive to the cumulative negative impact of multiple stressors (Atzaba-Poria, Pike, & Deater-Deckard, 2004; Greenberg, Speltz, Deklyen & Jones, 2001). Thus, it is of great importance to not only investigate the prevalence and severity of co-occurring internalizing and externalizing problems exhibited by children facing multiple early adversities, but to also examine what early childhood antecedents might buffer some at-risk children from developing these problem behaviors.

Although there has been a longstanding interest in understanding the co-occurrence of problem behaviors, it is notable that the majority of long-term longitudinal studies have examined the developmental trajectories of internalizing and externalizing problems separately. Consequently, the current study aims to contribute to a growing, yet more limited, body of research on the long-term, co-occurring development of problem behaviors. More specifically, the first goal was to identify co-occurring patterns (i.e., heterogeneous developmental trajectories) of internalizing and externalizing problem behaviors across the entire formal schooling period (i.e., grades 1 to 12) using a high frequency of measurement points (i.e., every year). The second goal was to examine a set of early childhood antecedents in order to identify which factors might account for individual differences in the development of co-occurring

internalizing and externalizing problems. To investigate these aims, this study used data from an at-risk sample of children facing both early family socioeconomic adversity and language difficulties.

3.1.1. Co-occurring Development of Internalizing and Externalizing Problems

The empirical evidence pertaining to the development of co-occurring internalizing and externalizing problems has been garnered from studies that have utilized both variable-centered and person-centered approaches. Findings from variable-centered studies which have typically focused on examining concurrent or prospective associations and (changes in) rank-order stability suggest that internalizing and externalizing problems often co-occur throughout childhood and adolescence, and exhibit transactional or reciprocal associations during these periods (Caspi & Moffitt, 2018; Farrington, 1995; Lahey et al., 2015; Lee & Bukowski, 2012). Moreover, findings from these studies provide support for a general psychopathology factor, indicating a shared commonality between internalizing and externalizing problems.

Using person-centered methods, several studies have examined the heterogeneity in the co-occurring developmental trajectories of internalizing and externalizing problems (see Chen & Simons-Morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Nivard et al., 2017; Wiggins, Mitchell, Hyde, & Monk, 2015). These methods (e.g., parallel-process latent class growth analysis or growth mixture modeling) allow for the identification of specific developmental trajectories (based on variations in severity and chronicity), and are ideal for detecting distinct subgroups of individuals who share similar developmental trends over time (Muthén & Muthén, 2000). Despite some methodological differences, four subtypes (trajectory classes) have been most consistently identified: 1) low-risk, 2) pure-externalizing, 3) pure-

internalizing, and 4) chronic co-occurring (see supplement materials section A for a more detailed discussion of each subtype).

Although there has been some consistency in the identification of these four subtypes, it is important to highlight that investigators have typically examined specific developmental epochs. For instance, patterns of co-occurring developmental trajectories have been previously documented in early childhood (i.e., ages 3 to 9; see Wiggins et al., 2015); middle childhood (ages 8 to 11; see Hinnant & El-Sheikh, 2013), early adolescence (grades 6 to 9; see Chen & Simons-Morton, 2009); and from early through late childhood (ages 2 to 12; see Fanti & Henrich, 2010). Thus, more is known about patterns of development *within* specific developmental periods, as opposed to potential continuity across longer periods of time, and more specifically, from early childhood through adolescence. However, there has been one published study, to my knowledge, that has examined the transition from childhood through adolescence. Using data from a long-term longitudinal project, Nivard and colleagues (2017) examined the development of co-occurring internalizing and externalizing problems from ages 7 to 15. One potential limitation of that study was that internalizing and externalizing problems were not assessed on a yearly basis (i.e., their assessments were conducted when participants were 7, 10, 13, and 15 years old), which may have decreased the ability to detect variations or heterogeneity in developmental trends across this period.

3.1.2. Early Childhood Individual and Contextual Antecedents

Differentiating children with co-occurring developmental trajectories from those who exhibit either internalizing or externalizing problems may also provide additional insights into the etiology of these problem behaviors in early childhood and the extent to which distinct trajectory subtypes either share common or unique antecedents. Common antecedents refer to

factors that are involved in the prediction of multiple trajectories, whereas unique antecedents contribute only to the prediction of a specific developmental trajectory subtype. The former construct aligns with the concept of multifinality, which argues that the same antecedents may lead to different forms of maladjustment (Cicchetti & Rogosch, 1996). It is also possible, however, that the antecedents which predict co-occurring problems are distinct from those which predict only one domain of problem behaviors (Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003). Efforts to differentiate the antecedents of these trajectory subtypes would not only contribute to my theoretical understanding of why children are at risk for manifesting different forms of problem behaviors in childhood and adolescence, but may also have implications for intervention and prevention efforts targeting the development of problem behaviors.

In the current study, we apply a risk and resilience framework (Masten, Best, & Garmezy, 1990) to evaluate the role of multiple early childhood antecedents. This framework considers how child adjustment is a dynamic process of adaptation in the context of adversity. This dynamic process has been argued to come from three sets of factors: attributes of the children themselves, characteristics of their families, and influences from their wider social environments (Rutter, 1987). That is to say, these three sets of factors can work to either mitigate or exacerbate children and adolescents' internalizing and externalizing problems in both additive and/or interactive ways. We refer to the attributes of the children themselves as individual factors and the characteristics of families and influences from wider social environments as contextual antecedents.

Additionally, we evaluate the potential additive effects of multiple *individual factors* including aspects of temperament and personality (e.g., ego-resiliency), difficulties in language ability, intelligence, and demographic characteristics such as gender and ethnicity, as well as

contextual factors consisting of maternal support and responsiveness, problems in interpersonal functioning with teachers and peers at school; and family socioeconomic adversity. My focus on considering the additive effects of these factors stems from the multiple risk factor model (Atzaba-Poria et al. 2004; Greenberg et al., 2001). According to this model, more severe and persistent forms of maladjustment are likely to be the result of multiple, co-occurring risk factors. Thus, it would be expected that children with chronic co-occurring problem behaviors are likely to exhibit a combination of early childhood risk factors across multiple domains (i.e., at the individual and contextual levels). Moreover, in consideration of resilience perspectives, it is plausible that chronic co-occurring problem behaviors are likely to emerge when children lack individual or contextual assets (e.g., ego-resiliency or supportive parenting) which may help to offset or diminish risk exposure. Although the independent effects of these factors have been substantiated in prior studies, much of this research has focused on internalizing and externalizing problems as distinct outcomes. Moreover, the potential additive effects of multiple individual characteristics and contextual experiences in distinct relational domains (i.e., parents, teachers, and peers) have not been comprehensively examined in one investigation. This has limited my ability to consider and detect potential confounding effects of the risk and protective factors most strongly associated with the development of co-occurring problems.

3.1.3. Study Aims and Hypotheses

The current study extends prior research in several ways as we examined the heterogeneity in the co-development of internalizing and externalizing problems across a longer time span than previously investigated (i.e., grades 1 to 12), and utilized a multi-informant and multi-method approach to assess the additive effects of multiple early childhood antecedents in a sample of at-risk children (predominantly from lower-income families and academically at-risk).

Compared to prior studies, we attempted to examine a broader range of antecedents, and incorporated factors that may confer both risk and resilience in the development of internalizing and externalizing problems. In light of the potential confounding effects of individual and contextual antecedents, children's individual characteristics (i.e., resilient personality, language ability, and intelligence), contextual factors (i.e., family socioeconomic adversity, maternal support and responsiveness, teacher-child conflict and peer rejection) and demographic characteristics (i.e., gender and ethnicity) were examined simultaneously to control for the effects of other factors. To effectively prevent and intervene in the co-development of problem behaviors, it is imperative to identify the most salient risk and protective antecedents that may be associated with their early onset.

With respect to my first aim, we expected to identify four co-developmental trajectory classes: a pure-internalizing, pure-externalizing, chronic co-occurring, and low-risk class. We hypothesized that the majority of children would be classified in the low-risk class (i.e., exhibiting low rates of internalizing and externalizing problems). Furthermore, we hypothesized that a relatively smaller subset of children would exhibit chronic co-occurring problem behavior trajectories. Considering that externalizing problems tend to be more salient and observable than internalizing problems, particularly in childhood, we hypothesized that a higher frequency of children would exhibit pure-externalizing problems compared to pure-internalizing problems.

With respect to examining early childhood antecedents, consistent with the multiple risk factor model, we hypothesized that children with chronic co-occurring problems would exhibit a more severe profile of early childhood individual and contextual antecedents compared to children whose developmental trajectories were characterized as being low-risk or pure-internalizing *or* externalizing problems (Atzaba-Poria et al., 2004; Greenberg et al., 2001). As a

complementary aim, we sought to further explore how these individual and contextual factors collectively functioned as common and unique antecedents which differentiated classification in the pure and co-occurring trajectory classes.

3.2. Method

3.2.1. Participants

A total of 784 first graders (47% girls), coming from one urban and two small city school districts in Texas, participated in a 12-year longitudinal study called 'Project Achieve'. Starting in the Fall of 2001, participants were followed annually from grades 1 to 12. At the first assessment, the average age was 6.57 years old ($SD = 0.38$). About 65% of participants qualified by income for free or reduced lunch (taken here as an index of socioeconomic status) and 42.5% had parents with a high school diploma or less educational background. The sample was ethnically diverse: 34.1% of the sample was White, 23.2% African-American, 37.4% Hispanic, 3.6% Asian or Pacific Islander, and 1.8% Other. Consistent with the broader aims of this research project, and to ensure that the recruited sample was academically at-risk, children were eligible to participate if they scored below the median on a state-approved district administered literacy test at the end of kindergarten or the beginning of grade 1. Eligible participants also spoke either English or Spanish, were not previously retained in the same grade, were not receiving special education services, and had their parents' written permission to join the project. Although the explicit aims of this recruitment strategy were to identify children who were academically at-risk, the sample was also predominately low-income, and exhibited socioeconomic risks as indicated by their qualification for free/reduced price school lunch and low parental education levels. A total of 1374 first-graders were identified who were eligible to participate in this study, and of the 1200 parent consent forms returned, 784 parents agreed to

have their children participate. Chi-square analyses indicated that there were no significant differences between the eligible participants with or without parental consent on their literacy test scores, age, gender, ethnicity, socioeconomic status, bilingual class placement, and cohort (see details in Hill & Hughes, 2007). The current study entitled Developmental Project received approval from the Institutional Review Board of Texas A&M University (Protocol No. 2015-0789M).

3.2.2. Procedure

This study used a multi-informant, repeated measures research design. More specifically, participating school districts provided the research team with information on participants' demographic background (i.e., age, gender, ethnicity, and eligibility for free or reduced-price lunch). All early childhood antecedents were measured in grade 1. Trained research staff conducted individually administered assessments with participants to gather data on their intelligence and language ability. Participants were also interviewed at school about their self-perceived maternal support and responsiveness at home. Teachers were asked to report on the target participants' personality attributes (ego-resiliency) and their relationship quality with the participants. Peer reports were collected using sociometric interviews with target participants and their classmates (those with written parental consent for providing nominations). Peers' perceptions of participants were obtained following procedures widely recommended in the peer assessment literature (Cillessen & Bukowski, 2000). Annually (from grades 1 to 12), teachers completed questionnaires on children's internalizing and externalizing problems (note that no assessments were conducted in grade 11).

3.3. Measures

3.3.1. Outcomes

3.3.1.1. Externalizing and Internalizing Problems

Externalizing and internalizing problems were measured annually with the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001), a 25-item teacher-report measure. Teachers responded to each item using a 3-point Likert-scale (0= *not true*, 1= *somewhat true*, 2= *certainly true*). Several studies have examined the validity and developmental appropriateness of the SDQ on samples of children and adolescents (He, Burstein, Schmitz, & Merikangas, 2013; Tsang, Wong, & Lo, 2012). Externalizing problems were assessed based on the average score of 10 items from the Conduct Problems scale (5 items: often fights, lies or cheats, steals from home, school or elsewhere, has temper tantrums) and the Hyperactivity-Inattention scale (5 items: e.g., restless, overactive, fidgeting or squirming). Internalizing problems were assessed based on the average score of 5 items from the Emotional Symptoms scale (e.g., complains of headaches, many worries, unhappy, nervous or clingy). Furthermore, a series of Confirmatory factor analysis (CFA) and longitudinal measurement invariance tests were performed, and the results showed that the internalizing and externalizing subscales demonstrated sound psychometric properties and longitudinal invariance across time (See Supplement Table S1 and S2). The reliability for these measures was adequate (see Table 3-1).

Table 3-1. Sample Characteristics

Problem Types (Reporter)	Grade	N	Mean	Median	SD	Min	Max	<i>a</i>
Internalizing (Teacher)	Grade 1	677	0.39	0.20	0.42	0.00	2.00	0.73
	Grade 2	621	0.35	0.20	0.41	0.00	2.00	0.71
	Grade 3	547	0.34	0.20	0.39	0.00	2.00	0.70
	Grade 4	528	0.38	0.20	0.45	0.00	2.00	0.77
	Grade 5	541	0.32	0.20	0.43	0.00	2.00	0.78
	Grade 6	439	0.25	0.00	0.39	0.00	2.00	0.79
	Grade 7	430	0.23	0.00	0.34	0.00	2.00	0.74
	Grade 8	437	0.19	0.00	0.32	0.00	2.00	0.74
	Grade 9	406	0.21	0.00	0.35	0.00	2.00	0.77
	Grade 10	436	0.24	0.00	0.39	0.00	2.00	0.81
Externalizing (Teacher)	Grade 12	390	0.21	0.00	0.34	0.00	2.00	0.77
	Grade 1	675	0.62	0.50	0.51	0.00	2.00	0.89
	Grade 2	619	0.58	0.40	0.51	0.00	2.00	0.89
	Grade 3	547	0.60	0.50	0.50	0.00	2.00	0.89
	Grade 4	528	0.57	0.50	0.49	0.00	2.00	0.88
	Grade 5	541	0.54	0.40	0.49	0.00	2.00	0.90
	Grade 6	439	0.53	0.40	0.49	0.00	2.00	0.90
	Grade 7	430	0.52	0.40	0.46	0.00	1.90	0.88
	Grade 8	437	0.48	0.30	0.44	0.00	2.00	0.88
	Grade 9	406	0.45	0.40	0.39	0.00	1.70	0.86
	Grade 10	435	0.47	0.30	0.42	0.00	1.80	0.87
	Grade 12	390	0.42	0.30	0.41	0.00	1.80	0.88
Individual Antecedents								
Ego-resiliency personality (Teacher)	Grade 1	699	10.32	10.46	2.41	3.57	15.00	0.94
Intelligence (Test)	Grade 1	767	93.06	94.00	14.63	48.00	132.00	0.94
Language ability (Test)	Grade 1	757	433.57	432.00	29.05	117.00	523.00	-
Contextual Antecedents								
Maternal support and responsiveness (Child)	Grade 1	737	2.86	2.83	0.66	1.17	4.00	0.72
Family SES adversity (Parent and school)	Grade 1	776	0.04	-0.01	0.74	-1.27	1.66	-
Teacher-child conflict (Teacher)	Grade 1	702	1.88	1.50	1.02	1.00	5.00	0.91
Peer rejection (Peer)	Grade 1	595	0.03	-0.94	0.95	-1.80	3.21	-

3.3.2. Early Childhood Individual Antecedents

3.3.2.1. Ego-resilient Personality

An adapted measure was used to assess ego-resilient personality. This measure consisted of a total of 22 items taken from the Child California Q-Set (CCQ; Block & Block, 1980) and the Big Five Inventory (BFI; John, Donahue & Kentle, 1991). Procedures for deriving this measure were adopted by Kwok et al. (2007) with this same dataset. Kwok et al. (2007) performed factorial analysis and validated a second-order ego-resilient personality factor. Both the CCQ and BFI use a 1-5 Likert scale (1= *strongly disagree* to 5= *strongly agree*). This measure had adequate internal consistency (Cronbach's alpha = .94).

3.3.2.2. Intelligence

The abbreviated version of the Universal Nonverbal Intelligence Test (UNIT) is a measure of general intelligence that evaluates children's memory and reasoning. The UNIT is administered using nonverbal gestures and has been found to be less culturally and linguistically biased than verbal measures (Bracken & McCallum, 1998). This measure has demonstrated high internal consistency and validity (Cronbach's alpha = .94).

3.3.2.3. Language Ability

Language ability was calculated with Woodcock-Johnson Tests of Achievement Third Edition (WJ-III ACH; Woodcock et al., 2001) using a composite of the Broad Reading W score (Letter-Word Identification, Reading Fluency, and Passage Comprehension). If children were more proficient in Spanish than in English, they were administered the comparable Spanish version of the Woodcock-Johnson Tests of Achievement-Revised and the Woodcock Compuscore program yields comparable scores for the revised version. Both versions of this

measure have been used extensively in education research, and demonstrate adequate reliability and validity (Woodcock et al., 2001).

3.3.3. Early Childhood Contextual Antecedents

3.3.3.1. Maternal Support and Responsiveness

Children reported on their maternal support and responsiveness with a 6-item questionnaire adapted from the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter, 1985) using a 4-point Likert scale (1= *Hardly ever*, 2= *Sometimes*, 3= *Usually*, and 4= *Always*). Sample items are ‘mom smiles’, ‘mom takes you places you like’, ‘mom reads to you’, and ‘mom plays with you’. The scale demonstrated acceptable internal consistency (Cronbach’s alpha = .72).

3.3.3.2. Family Socioeconomic Adversity

Based on both school records and parents’ reports, family socioeconomic (SES) adversity was calculated as the mean of the standardized scores on five domains: eligibility for free or reduced lunch (coded 0-1; 1= *yes*), single-parent status (coded 0-1; 1= *yes*), rental status (coded 0-1; 1= *yes*), the highest occupational level of any adult in the home (coded 1-9; e.g., 9= *farm laborers/mental service workers*; 5= *clerical and sales work*; 1= *higher executives, proprietors of large businesses*), and the highest education level of any adult in the home (coded 1-10; e.g., 10= *elementary school*; 5= *some college education*; 1= *Ph.D., MD, or equivalent*). A higher score represented higher family SES adversity.

3.3.3.3. Teacher-child Relationship Conflict

A 6-item teacher-reported measure was used to assess teacher-child conflict. This measure was developed from the Teacher Relationship Inventory (TRI; Furman & Buhrmester, 1985; 5-point Likert scale; 1= *not at all true* to 5= *very true*) and has been validated previously

with the current dataset by Wu and Hughes (2014). Sample items are: ‘This child and I often argue or get upset with each other’ and ‘I often need to discipline this child’. The scale demonstrated excellent internal consistency (Cronbach’s alpha = .91).

3.3.3.4. Peer Rejection

Children were asked to rate how much they like, or do not like, to play with each child in their classroom by pointing to one of 5 faces, ranging from a sad face (1= *Don’t like at all*) to a happy face (5= *Like very much*). A rating of “1” was considered equivalent to a “liked least” nomination score (Asher & Dodge, 1986). A participant’s peer rejection score was the total number of “1” ratings they received from classmates. These scores were standardized by classroom to adjust for differences in class size (i.e., number of nominators).

3.4. Data Analysis Plan

All analyses were performed in Mplus version 7.4 (Muthén & Muthén, 2012), using full-information maximum likelihood estimation with robust standard errors (MLR). First, unconditional parallel-process growth mixture models (GMMs) were estimated to assess the joint developmental trajectories of children’s externalizing and internalizing problems from grades 1 to 12 (Muthén & Muthén, 2000). These models were specified with varying numbers of classes (i.e., 1 to 6 class models). Model fit was assessed using a combination of fit indices including the Akaike information criterion (AIC), Bayesian information criterion (BIC), sample size-adjusted Bayesian information criterion (SSABIC), Lo-Mendell-Rubin likelihood ratio test (LMR-LRT), bootstrap likelihood ratio test (BLRT), and entropy (Nylund, Asparouhov, & Muthén, 2007). Smaller values on the AIC, BIC, and SSABIC are indicative of better model fit (Schwartz, 1978). A nonsignificant LMR-LRT or BLRT statistic suggests that a model with one fewer class is preferred (Nylund et al., 2007). An average entropy value greater than .70 is

indicative of a model with adequate classification precision (Muthén, 2000). In addition to examining these fit indices, the qualitative nature of the classes was assessed to ascertain that they were conceptually meaningful and interpretable. Initially, the GMMs were specified using a quadratic latent factor to assess non-linear growth, however, quadratic effects were consistently small and not statistically significant. Therefore, this factor was removed, and results are presented for the more parsimonious linear models.

Second, after identifying the optimal unconditional model, a predictive model was specified which included the early childhood (grade 1) individual and contextual antecedents as predictors of the trajectory classes. Using multinomial logistic regression, all predictors were entered in the model simultaneously, thus the estimates for the predictors are controlling for the effects of other predictors. For each predictor, odds ratios (ORs) and significance estimates are reported (predictors were standardized at this step to facilitate the interpretation of the ORs).

3.5. Results

3.5.1. Preliminary Analyses

Rates of missing data increased with the passage of time (see Table 3-1 for the sample sizes at each wave). To assess whether the data were missing completely at random (MCAR), a Little's MCAR test was performed using all study variables, which was statistically significant at a *marginal* level ($\chi^2(7531) = 7730.647, p = .053$), indicating that the MCAR assumption may have been met. Subsequently, to assess some of the possible causes of missing data, a series of univariate t-tests and chi-square tests were performed. These tests indicated that there were no statistical differences between children who had complete or missing data on the internalizing and externalizing measures with respect to their individual characteristics (i.e., ego-resilient personality, intelligence, and language ability) and contextual factors (i.e., maternal support and

responsiveness, teacher-child conflict, peer rejection, and family socioeconomic adversity). The current study investigated more likely to have missing data at two waves (grade 7, $\chi^2 = 4.67, p = .031$; grade 3, $\chi^2 = 4.87, p = .034$, respectively), but their rates of missing data were comparable at other waves. Additional comparisons were made to see if attrition was associated with grade 1 levels of internalizing and externalizing problems. Results indicated that students who had dropped out of the study in grade 12 were more likely to be high in grade 1 externalizing problems ($F = 12.166, p = .023$), but the effect size was small, and no other significant associations were found. Taken together, although the missing data analyses indicated that there were some observable causes for missing data, because these factors were accounted for in the modeling design, the use of full information maximum likelihood (FIML) estimation is considered to be an appropriate strategy and produces unbiased estimates when data are missing at random (Enders, 2010).

Descriptive statistics for all study variables are reported in Table 3-1. Before examining models with heterogeneous trajectory classes, a parallel process latent growth model was estimated to assess normative changes in externalizing and internalizing problems, as well as the variances and correlations among the latent factors. On average, there were significant mean level decreases for both externalizing and internalizing problems from grades 1 to 12, with externalizing problems exhibiting a higher starting value than internalizing problems. The correlations among internalizing and externalizing growth factors were also statistically significant (see Table S3). The bivariate correlations for all study variables are reported in Supplement Table S4. On average, internalizing problems and externalizing problems were significantly and moderately (positively) correlated over time. Compared to internalizing problems, externalizing problems showed higher and more consistent correlations with the

individual and contextual variables. All the early childhood antecedents were generally weakly associated with each other, except for ego-resilient personality and teacher-child conflict which were moderately (negatively) correlated.

3.5.2. Co-Occurring Development of Internalizing and Externalizing Problems.

Model fit indices for the joint trajectory models are reported in Table 3-2. Comparing the models with varying numbers of classes, the results indicated that the AIC, BIC, and SSABIC scores decreased as the number of classes increased. Across all models, the BLRT was statistically significant and Entropy values were high (above .80). In addition, the LMR-LRT was not statistically significant for the four-class model, suggesting that the three-class model fit the data better. Although the LMR-LRT favored the 3-class solution, other information criteria (AIC, BIC, SSABIC) and BLRT favored models with additional classes. Since the fit indices were not consistently indicative of one model having the best fit, it was critical to plot models with varying classes in order to assess their interpretability. Specifically, when comparing the 3- and 4-class models, the 4-class model identified an additional pure-externalizing class which we considered to be a distinct class that characterized children and adolescents who were high on externalizing problems but exhibited lower rates of internalizing problems. Comparing the 4- and 5-class models, the additional trajectory class identified in the 5-class model was not qualitatively distinct from the classes identified in the 4-class model (i.e., the 5-class model essentially identified two low-risk classes), and was relatively small (about 7% of children). Moreover, the models with 5- and 6-classes had some convergence problems (i.e., perturbed starting values).

In light of these model comparisons, we selected the 4-class model which included *chronic co-occurring* (N=233; 30.1%), *moderate co-occurring* (N=221; 28.5%), *pure-externalizing* (N=144; 18.6%), and *low-risk* (N=175, 22.6%) classes (see Figure 2-3). Notably, a *Pure-internalizing* class was not identified. Additional Wald Chi-square Tests were performed (see Table S5) to examine whether the estimates for the latent intercept factors across the four trajectory classes were statistically different from each other. The results indicated that the intercepts were statistically different from each other (except for the differences between the pure-externalizing and low-risk group on the internalizing problem) indicating that the classes were distinct from one another.

Table 3-2. Model Fit Indices and Criteria for the Joint Trajectory One-Through Six-Class Models

<i>C</i>	<i>AIC</i>	<i>BIC</i>	<i>SSABIC</i>	<i>Entropy</i>	<i>LMR-LRT</i>	<i>P value</i>	<i>Bootstrap log likelihood</i>	<i>Bootstrap p value</i>
1	12545.549	12573.451	12554.395					
2	9211.802	9272.256	9230.974	0.882	3277.345	p<.001	-6266.775	p<.001
3	8470.755	8563.760	8500.251	0.836	739.169	p<0.05	-4592.901	p<.001
4	7791.659	7917.217	7831.479	0.838	678.520	P=0.173	-4215.377	p<.001
5	7492.370	7650.480	7542.514	0.838	306.701	P=0.145	-3868.830	p<.001
6	7200.383	7391.044	7260.850	0.848	332.370	P=0.685	-3728.947	p<.001

Notes: Model including internalizing and externalizing symptoms are shown. The optimal model is shown in bold font. AIC=Akaike information criterion; BIC=Bayesian information criterion; SSABIC=Sample-size adjusted Bayesian information criterion; LMR-LRT= Lo-Mendell-Rubin likelihood ratio test. Examining Antecedents of the Trajectory Classes

3.5.3. Examining Antecedents of the Trajectory Classes

After selecting the 4-class model as the optimal solution, this model was re-specified to include the early childhood individual and contextual antecedents. Multinomial logistic regression was used to assess which individual and contextual antecedents were significantly associated with class membership, controlling for the effects of other predictors. Odds ratios (OR) and significance tests are reported in Table 3-3. The first set of results consisted of using the low-risk class as the reference group. Subsequently, each of the three risk classes was compared with one another to further distinguish potential subgroup differences among the chronic co-occurring, moderate co-occurring and pure-externalizing groups.

Compared to the low-risk group, children in the moderate co-occurring group had lower ego-resiliency but were not significantly different on any of the other predictors. Children in the pure-externalizing group had lower ego-resiliency, higher levels of teacher-child conflict, and were more likely to be males, and African-American or Hispanic, compared to the low-risk group. Children in the chronic co-occurring group were characterized by lower ego-resiliency, lower language ability, higher levels of teacher-child conflict and peer rejection and were more likely to be males, compared to the low-risk group. Contrary to expectations, intelligence, maternal support and responsiveness and family socioeconomic adversity were not significantly associated with being in any of the risk groups.

Additional analyses were performed in order to make comparisons among the three risk groups. Compared to the moderate co-occurring group, children in the pure-externalizing group had higher teacher-child conflict, and were more likely to be boys, and African-American. Compared to the pure-externalizing group, children in the chronic co-occurring group had lower ego-resiliency and experienced higher peer rejection. Compared to the moderate co-occurring group, children in the chronic co-occurring group had lower ego-resiliency, lower language ability, higher levels of teacher-child conflict and peer rejection and were more likely to be males and African-American.

Table 3-3. Multinomial Logistic Regression Analyses Comparing the Four Co-Development Trajectories in Terms of Early Childhood Antecedents (N =784)

Early Childhood Factors	Moderate co-occur	Pure-externalizing	Chronic co-occur	Pure-externalizing	Chronic co-occur	Chronic co-occur
	vs	vs	vs	vs	vs	vs
	Low-risk	Low-risk	Low-risk	Moderate co-occur	Pure-externalizing	Moderate co-occur
Early individual antecedents		Odds ratios				
1 Ego-resilient personality	0.304***	0.303***	0.116***	0.995	0.383***	0.381***
4 Gender (1=boys)	1.263	4.785***	4.103***	3.794***	0.854	3.248***
3 Language ability	0.889	0.741	0.557**	0.841	0.750	0.630*
2 Intelligence	0.788	0.822	0.830	1.042	1.010	1.053
5 African-American	0.842	3.444*	2.382	4.107**	0.692	2.841*
6 Hispanics	1.141	2.159*	1.422	1.892	0.660	1.250
Early contextual antecedents						
7 Maternal support and responsiveness	0.976	0.841	0.893	0.860	1.062	0.913
8 Family SES adversity	1.057	0.695	0.993	0.652	1.435	0.936
9 Teacher-child relationship-Conflict	0.764	4.202***	5.911***	5.408***	1.409	7.618***
10 Peer rejection	0.940	1.487	2.143**	1.568	1.443*	2.263**

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

3.5.4. Co-Occurring Development of Internalizing and Externalizing Problems

The identification of two distinct co-occurring developmental patterns (i.e., moderate and chronic co-occurring) fit well with the proposition that co-occurrence (of internalizing and externalizing problems) should be regarded as a distinct syndrome or symptomology (Lilienfeld, 2003). Moreover, these results indicated heterogeneity in the severity of co-occurring problem behaviors, which is a finding that has been identified in previous studies (e.g., Chen & Simons-Morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Wiggins et al., 2015). The identification of a pure-externalizing group was also consistent with previous literature (Chen & Simons-Morton, 2009; Fanti & Henrich, 2010; Nivard et al., 2017). Though most of my findings were in line with other studies, there were also some discrepancies. Most notably, we did not identify a pure-internalizing trajectory class, despite the fact that this subgroup has been identified by other investigators (see Chen & Simons-Morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013). Although the reasoning for this discrepancy is unclear, there are several possible explanations. It is notable that this subgroup identified by Fanti and Henrich (2010) was relatively small (only 2.3% of children), and this investigation consisted of a larger sample size than the one used in the present study. Thus, we may not have had a sufficient sample size to identify this distinct, yet small, subgroup of children. Furthermore, the informant type and developmental period also differed between the two studies. For instance, in contrast to assessing teacher-reports in the current study, Fanti and Henrich utilized mother reports. It is possible that mothers may be more observant of young children's internalizing symptoms compared with teachers or other informants (Keiley et al., 2000). With respect to potential developmental differences in class identification, it is notable that Nivard et al. (2017), who also investigated trajectories across childhood and adolescence similarly did not identify a pure

internalizing class. They reasoned that there may be a low prevalence of children with pure and chronic internalizing problems (in combination with low externalizing problems), particularly across childhood and adolescence. However, these investigators identified an adolescent-onset internalizing group with low levels of externalizing problems, which was not identified in my sample. As an alternative explanation, it may be important to further scrutinize potential developmental differences in subtypes or forms of internalizing problems. For instance, Cohen and colleagues (2018) found that symptoms reflecting anxiety and depression exhibited variations in their developmental progression (e.g., homotypic versus heterotypic continuity) from childhood to adolescence. In the current study, the measure of internalizing behaviors consisted of items that reflected both anxious and depressive symptoms. Although the analyses indicated that this measure maintained longitudinal invariance, it is possible that measures of internalizing behaviors which are more reflective of anxiety, as opposed to depression, may exhibit an earlier onset, which was not observed in the current study (Cohen et al., 2018).

In terms of the prevalence of symptoms, co-occurrence between internalizing and externalizing is common as 50% of those who qualify for a clinical diagnosis qualify for more than one (Newman et al., 1998). Though a handful of studies report prevalence rates of co-occurring internalizing and externalizing problems, constructing a comprehensive set of comparisons across these studies is difficult due to the diversity of measures used to assess the focal constructs, and variations in the developmental periods investigated. Thus, there remain gaps and inconsistencies in terms of the prevalence rates reported in the existing literature.

3.5.5. Early Childhood Individual and Contextual Antecedents

The results indicated that children belonging to the *chronic* co-occurring group were more likely to experience multiple individual and contextual difficulties compared to the other

classes. These findings are in line with the multiple risk factor model which emphasizes the additive effects of multiple risk antecedents that lead to problem behavior symptomology (Atzaba-Poria et al., 2004; Greenberg et al., 2001). In addition, compared to the moderate co-occurring group, the chronic co-occurring group appeared to be more maladjusted with respect to the early childhood individual and contextual antecedents, which indicated that the accumulated and unique challenges faced by children in this group may have contributed to their more severe profile of co-occurring problem behaviors. Although the moderate co-occurring and chronic co-occurring groups also displayed some common antecedents, the odds ratios indicated that these factors contributed more strongly to being in the chronic co-occurring group. Stated differently, higher conflict with teachers, higher rejection from peers, and lower ego-resiliency increased the likelihood that children exhibited chronic, as opposed to moderate, co-occurring problems. Additionally, compared to the moderate co-occurring group, the pure-externalizing group showed higher levels of conflict with teachers in early childhood. This suggests that poor interpersonal relationships in a classroom context may increase the rate and severity of externalizing problems in school settings.

3.5.6. Early Childhood Common and Unique Antecedents

Applying risk and resilience frameworks, we evaluated how attributes of the child (i.e., individual characteristics), and parent-, peer- and teacher-child relationships (i.e., contextual factors) in early childhood functioned to either ameliorate or exacerbate the likelihood that children would exhibit internalizing and externalizing problems across childhood and adolescence. Taken together, the results revealed a pattern in which individual resilience factors and contextual risks exhibited an additive effect. Moreover, one of the primary aims of this study was to further differentiate how these early childhood antecedents were either more

broadly associated with risk group membership (i.e., common factors that predicted membership across multiple groups) or uniquely associated with membership in a specific risk group. The results provided support for both a combination of common and unique antecedents. Persistent *common* antecedents included ego-resilient personality, gender and teacher-child conflict. That is, children who were characterized with low ego-resiliency, being a boy, and higher rates of conflict with teachers were at greater risk for developing either pure or co-occurring problems.

The protective role of ego-resilient personality for developing externalizing or co-occurring problems may result from its associated trait characteristics. Resilient coping skills, such as being confident and resourceful, may make some children more resistant to adverse environmental experiences and allow them to recover and establish a positive developmental trajectory in the face of adversity (Masten et al., 1990). For instance, individuals with high ego-resiliency have been characterized as being neither under controlled (e.g., exhibiting impulsiveness, distractibility, hostility, and emotional lability), nor over-controlled (e.g., inhibited, shy, fearful, withdrawn; Krettenauer, Ullrich, Hofmann, & Edelstein, 2003). This characteristic or dispositional style may contribute to how they are flexible in the face of new and challenging circumstances and more likely to recover from adverse events. In contrast, individuals with low ego-resiliency who are either under or overcontrolled, are more likely to exhibit cognitive, emotional, and interpersonal difficulties which may exacerbate their risks for developing both internalizing and externalizing problems (Deutz et al., 2018; Krettenauer et al., 2003).

In addition to ego-resilient personality, my study highlighted the negative influence of teacher-child conflict on the development of pure and co-occurring problems. Researchers have long recognized the importance of teachers as socialization agents that may enhance children's

social and emotional development. Experiencing repeated conflicts with teachers may deprive children from learning how to recognize and address their feelings, and prevent them from regulating their emotions and behaviors, thus increasing their risks for internalizing and externalizing problems (Woltering & Shi, 2016). It is also possible that when there is a high-quality supportive classroom environment, students can use their teachers as resources to actively engage in social interactions, better navigate their emotions and behaviors, and resolve interpersonal conflicts more effectively (O'Connor, Dearing, & Collins, 2011).

The results indicated that peer rejection was a *unique* antecedent for the chronic co-occurring class as children who belonged to this group experienced higher peer rejection compared to the moderate co-occurring, the pure-externalizing and the low-risk classes. Moreover, the pure-externalizing and moderate co-occurring classes had comparable levels of peer rejection in comparison to the low-risk class. Although other studies have reported that elevated levels of peer rejection may contribute to the development of pure-externalizing problems (Keiley et al., 2003), the findings reported in the current study are notable in that they suggest that the relational adversities experienced by children with pure-externalizing and moderate co-occurring problems may not be as severe as those experienced by children with chronic co-occurring problems. It is possible that some children who engage in externalizing behaviors, either in moderation or in the absence of internalizing problems, may use these behaviors as a means to enhance their social status or popularity, resulting in more normative rates of peer rejection (Ettetal & Ladd, 2015a).

Language ability was also found to be a *unique* antecedent for the chronic co-occurring group as these children scored significantly lower on language ability compared to the moderate co-occurring, the pure-externalizing, and the low-risk groups, even within a sample of

academically at-risk children. Adequate language processing is necessary for emotional and behavioral success in school, and allows children to more successfully navigate the dynamic, language-rich environments of classrooms and schools (Chow & Wehby, 2018). However, children with low language capacities tend to struggle with communicating and interpreting social cues and may be at increased risk of developing behavioral and social problems (Horowitz, Jansson, Ljungberg, & Hedenbro, 2005).

We also investigated the effects of children's gender, ethnicity, and socioeconomic adversity on their co-occurring internalizing and externalizing trajectories. Taken together, the results indicated that children's gender and ethnicity were significantly associated with several of the identified trajectory groups. That is, boys and African-American children were more likely to belong to the chronic co-occurring and the pure-externalizing classes. Hispanic children were also significantly more likely to be in the pure-externalizing class. These findings are consistent with a large body of literature which indicates that boys and ethnic minorities are at greater risk for internalizing and externalizing problems (Rosenfield & Mouzon, 2013). Socioeconomic adversity was not associated with any of the co-occurring trajectory classes. This may be due to its potential confounding associations with ethnicity (Samaan, 2000), or alternatively, given that the majority of the sample was low income, perhaps there was not sufficient variability to detect its effects.

3.5.7. Implications

Findings from the current study highlight the importance of fostering social support and ego resiliency in early childhood in order to reduce engagement in long-term problem behaviors. Notably, many of the antecedents identified in the current study (ego-resiliency, language ability, teacher-child conflict, peer rejection) are malleable factors that, with intervention, may hold

great promise for reducing risk, and promoting more adaptive behavioral outcomes. Consequently, my findings provide support for the implementation of pre- and elementary school whole-school universal social-emotional learning (SEL) programs, and more specifically, programs which apply comprehensive approaches to not only aid in improving children's interpersonal skills, but also foster resiliency and communication skills (Masten et al., 1990; Oland & Shaw, 2005). In line with findings which indicated greater risks for African-American students, there also remains a need for more culturally responsive SEL intervention efforts and programming (Graves et al., 2017). Notably, because intervention programs are frequently designed to target one form of problem behavior, studies that aim to evaluate their effectiveness may not be designed to differentiate program effects on children with pure and co-occurring internalizing and externalizing problems, which may obfuscate potential intervention effects on distinct subgroups (Oland & Shaw, 2005). Without effective interventions, these pure and co-occurring behavior patterns are likely to persist and potentially escalate into other forms of maladaptive behavior (Ettetal & Ladd, 2015b). Thus, attempts to better understand the etiology of internalizing and externalizing problem behaviors, and to more accurately identify the common and unique antecedents associated with their development may have important implications for evidence-based intervention efforts (Cosgrove et al., 2011).

3.5.8. Strengths, Limitations, Future Directions

Strengths of this investigation included a relatively large sample of children followed from grades 1 to 12. The twelve data points used to measure externalizing and internalizing problems enhanced the reliability and flexibility of the longitudinal analyses (Singer, Willett, & Willett, 2003). Furthermore, the analyses incorporated data from multiple informants and multiple methods. From an analytic standpoint, my person-centered modeling approach allowed

for the investigation of multiple co-development patterns by accounting for heterogeneity in children's developmental trajectories, as well as assessing potential nonlinear change. The current study also extended previous literature and examined a broader range of early childhood antecedents ranging from individual characteristics such as ego-resilient personality, intelligence, language ability, gender, ethnicity, and contextual factors including family socioeconomic adversity, maternal support and responsiveness, teacher-child conflict, and peer rejection. This approach contributed to a more comprehensive understanding of how and why children deviate from more normative developmental trajectories and develop various co-occurring problem behaviors.

Notwithstanding these strengths, there are several notable limitations. One limitation of the current study was that externalizing and internalizing problems were measured exclusively by teacher reports. Because internalizing problems tend to be less disruptive for classroom management and instruction than externalizing problems, teachers may be less attuned to observing these symptoms, particularly when they have large classrooms and many students to interact with on a daily basis. The second limitation was the attrition rate which could restrict the generalizability of my findings. The third limitation, or consideration, of the current study also involved generalizability because we focused on an at-risk sample. Few studies, however, have focused specifically on children facing multiple early adversities. Thus, my sample may be viewed as a strength for replicating and expanding existing findings which have typically been based on more normative samples.

There are several future directions that may extend the findings reported in the current study. First, considering that my research design focused on examining additive individual and contextual effects, one future direction may be to further investigate interactive effects among

the early childhood antecedents. Consistent with person by environment models, it is plausible that certain individual factors may be exacerbated under specific contextual conditions, however, we were not able to explicitly test this hypothesis. Second, there remains a need for additional person-centered research to further explicate the potential common and unique individual and contextual antecedents which may differentiate co-occurring problem behaviors from pure internalizing and externalizing problems. For example, in addition to ego-resiliency, other temperament factors such as negative emotionality, impulsivity, difficult temperament, and effortful control have also been associated with both internalizing and externalizing problems (Keiley et al, 2003; Eisenberg et al., 2003). However, studies related to this area of investigation have not consistently examined the development of co-occurring problems, or accounted for multiple contextual (i.e., parent, teacher and peer) influences in their research designs. Third, further studies are needed to examine the effects of a broad range of individual and contextual antecedents during infancy and the preschool period. It may be the case that pre-existing problem behaviors contributed to some of the difficulties children experienced by the time they entered grade 1 (Wiggins et al., 2015. For instance, teacher-child conflict can also increase due to existing problem behaviors (Ettetal & Shi, in press), potentially leading to a maladaptive cycle. Fourth, future studies can further examine the heterogeneity of internalizing and externalizing problems at a higher-order-level. In my study, an examination of the trajectories (i.e., intercept and slope effects) for both the moderate and chronic co-occurring groups revealed a developmental pattern in which externalizing and internalizing problems appeared to develop in parallel. That is, although initial rates (intercepts) appeared to vary with externalizing problems being more severe than internalizing problems, the rates of discontinuity (i.e., declining slopes) were relatively similar. Specifically, the general psychopathology model assumes that both

internalizing and externalizing problems share a generalized underlying vulnerability (i.e., a common syndrome explanation) in which symptoms of distinct problematic behaviors are, in part, explained by one general psychopathology factor (p-factor) that reflects common features across all forms of psychopathology (Caspi et al., 2014; Caspi & Moffitt, 2018). This may suggest that the heterogeneity in co-occurring problems may exist at a higher-order-level factor (Deutz et al., 2018). Finally, although the current study examined linear and non-linear changes in problem behaviors across childhood and adolescence, there may be other models that warrant further investigation. For instance, future research may further examine whether the transition to adolescence functions as a sensitive period in which children exhibit qualitative changes in their problem behaviors (e.g., the transition from one class to another).

3.6. Conclusion

Applying risk and resilience frameworks, the current study contributes to ongoing research on the co-development of internalizing and externalizing problems, and also examined multiple individual and contextual antecedents related to the distinct problem behavior risk groups. My study identified that roughly half of the children showed a developmental trajectory which could be characterized by co-occurring problems. The chronic co-occurring children displayed the most severe profiles of early childhood antecedents as they showed the lowest scores on ego-resilient personality, lower language ability, and higher conflict with teachers and peers. More specifically, among the significant antecedents, early childhood ego-resiliency and teacher-child conflict exhibited the strongest additive effects with respect to membership in the pure externalizing, moderate and chronic co-occurring trajectory groups. In contrast, language ability and peer rejection contributed unique and additive effects associated with an increased risk for being in the chronic co-occurring group. My study emphasizes the severe consequences

of conflictual interpersonal relationships with teachers and peers on the development of various forms of problem behavior. Moreover, my study highlights the importance of early childhood temperamental attributes on the development of internalizing and externalizing problems. That is, having an ego-resilient personality appeared to be an important protective factor in reducing children's risks for co-occurring externalizing and internalizing problems.

3.7. References

Achenbach, T. M., Ivanova, M. Y., Rescorla, L. A., Turner, L. V., & Althoff, R. R. (2016).

Internalizing/externalizing problems: Review and recommendations for clinical and research applications. *Journal of the American Academy of Child & Adolescent Psychiatry, 55*, 647–656.

Asher, S. R., & Dodge, K. A. (1986). Identifying children who are rejected by their peers. *Developmental Psychology, 22*, 444–449.

Atzaba-Poria, N., Pike, A., & Deater-Deckard, K. (2004). Do risk factors for problem behaviour act in a cumulative manner? An examination of ethnic minority and majority children through an ecological perspective. *Journal of Child Psychology and Psychiatry, 45*, 707–718.

Block, J., & Block, J. (1980). *California Child Q-set*. Consulting Psychologists Press.

Bracken, B. A., & McCallum, R. S. (1998). *Universal nonverbal intelligence test*. Chicago: Riverside Publishing Company.

Caspi, A., & Moffitt, T. E. (2018). All for one and one for all: Mental disorders in one dimension. *American Journal of Psychiatry, 175*, 831–844.

Chen, R., & Simons–Morton, B. (2009). Concurrent changes in conduct problems and depressive symptoms in early adolescents: A developmental person–centered approach.

- Development and Psychopathology*, 21, 285–307.
- Chow, J. C., & Wehby, J. H. (2018). Associations between language and problem behavior: A systematic review and correlational meta-analysis. *Educational Psychology Review*, 30, 61–82.
- Cicchetti, D., & Rogosch, F. A. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology*, 8, 597–600.
- Cillessen, A. H., & Bukowski, W. M. (2000). *Recent advances in the measurement of acceptance and rejection in the peer system*. San Francisco: Jossey-Bass
- Cohen, J. R., Andrews, A. R., Davis, M. M., & Rudolph, K. D. (2018). Anxiety and depression during childhood and adolescence: testing theoretical models of continuity and discontinuity. *Journal of Abnormal Child Psychology*, 46, 1295–1308.
- Coie, J. D., Lochman, J. E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *Journal of Consulting and Clinical Psychology*, 60, 783–792.
- Cosgrove, V. E., Rhee, S. H., Gelhorn, H. L., Boeldt, D., Corley, R. C., Ehringer, M. A., ... & Hewitt, J. K. (2011). Structure and etiology of co-occurring internalizing and externalizing disorders in adolescents. *Journal of Abnormal Child Psychology*, 39, 109–123.
- Deutz, M. H., Shi, Q., Vossen, H. G., Huijding, J., Prinzie, P., Deković, M., ... & Woltering, S. (2018). Evaluation of the Strengths and Difficulties Questionnaire-Dysregulation Profile (SDQ-DP). *Psychological Assessment*, 30, 1174–1185.
- Eisenberg, N., Valiente, C., Fabes, R. A., Smith, C. L., Reiser, M., Shepard, S. A., ... & Cumberland, A. J. (2003). The relations of effortful control and ego control to children's

- resiliency and social functioning. *Developmental Psychology*, 39, 761–776.
- Enders, C. K. (2010). *Applied missing data analysis*. Guilford press.
- Ettekal, I & Shi, Q. (in press). Developmental Trajectories of Teacher-Student Relationships and Longitudinal Associations with Children's Conduct Problems from Grades 1 to 12. *Journal of School Psychology*.
- Ettekal, I., & Ladd, G. W. (2015). Costs and benefits of children's physical and relational aggression trajectories on peer rejection, acceptance, and friendships: Variations by aggression subtypes, gender, and age. *Developmental Psychology*, 51, 1756–1770.
- Ettekal, I., & Ladd, G. W. (2015). Developmental pathways from childhood aggression–disruptiveness, chronic peer rejection, and deviant friendships to early-adolescent rule breaking. *Child Development*, 86, 614–631.
- Ettekal, I., Eiden, R. D., Nickerson, A. B., Molnar, D. S., & Schuetze, P. (2019). Developmental cascades to children's conduct problems: The role of prenatal substance use, socioeconomic adversity, maternal depression and sensitivity, and children's conscience. *Development and Psychopathology*, 1–19.
- Fanti, K. A., & Henrich, C. C. (2010). Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: Findings from the National Institute of Child Health and Human Development Study of Early Child Care. *Developmental Psychology*, 46, 1159–1175.
- Farrington, D. P. (1995). The development of offending and antisocial behaviour from childhood: Key findings from the Cambridge Study in Delinquent Development. *Journal of Child Psychology and Psychiatry*, 6, 929–964.
- Francis, R., Hawes, D. J., & Abbott, M. (2016). Intellectual giftedness and psychopathology in

- children and adolescents: A systematic literature review. *Exceptional Children*, 82, 279–302.
- Furman, W., & Buhrmester, D. (2009). Methods and measures: The network of relationships inventory: Behavioral systems version. *International Journal of Behavioral Development*, 33, 470–478.
- Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology*, 16, 313–333.
- Graves Jr, S. L., Herndon-Sobalvarro, A., Nichols, K., Aston, C., Ryan, A., Blefari, A., ... & Prier, D. (2017). Examining the effectiveness of a culturally adapted social-emotional intervention for African American males in an urban setting. *School Psychology Quarterly*, 32, 62–74.
- Greenberg, M. T., Speltz, M. L., DeKlyen, M., & Jones, K. (2001). Correlates of clinic referral for early conduct problems: Variable–and person–oriented approaches. *Development and Psychopathology*, 13, 255–276.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher–child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development*, 72, 625–638.
- Hanson, J. L., van den Bos, W., Roeber, B. J., Rudolph, K. D., Davidson, R. J., & Pollak, S. D. (2017). Early adversity and learning: Implications for typical and atypical behavioral development. *Journal of Child Psychology and Psychiatry*, 58, 770–778.
- Harter, S. (1985). *Manual for the self-perception profile for children:(revision of the perceived competence scale for children)*. University of Denver.
- He, J. P., Burstein, M., Schmitz, A., & Merikangas, K. R. (2013). The Strengths and Difficulties Questionnaire (SDQ): the factor structure and scale validation in US adolescents. *Journal*

- of Abnormal Child Psychology*, 41, 583–595.
- Hill, C. R., & Hughes, J. N. (2007). An examination of the convergent and discriminant validity of the Strengths and Difficulties Questionnaire. *School Psychology Quarterly*, 22, 380–406.
- Hinnant, J. B., & El-Sheikh, M. (2013). Codevelopment of externalizing and internalizing symptoms in middle to late childhood: Sex, baseline respiratory sinus arrhythmia, and respiratory sinus arrhythmia reactivity as predictors. *Development and Psychopathology*, 25, 419–436.
- Hollo, A., Wehby, J. H., & Oliver, R. M. (2014). Unidentified language deficits in children with emotional and behavioral disorders: A meta-analysis. *Exceptional Children*, 80(2), 169–186.
- Horowitz, L., Jansson, L., Ljungberg, T., & Hedenbro, M. (2005). Behavioural patterns of conflict resolution strategies in preschool boys with language impairment in comparison with boys with typical language development. *International Journal of Language & Communication Disorders*, 40, 431–454.
- John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory—Versions 4a and 54*, CA: University of California, Berkeley, Institute of Personality and Social Research.
- Keiley, M. K., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2000). A cross-domain growth analysis: Externalizing and internalizing behaviors during 8 years of childhood. *Journal of Abnormal Child Psychology*, 28, 161–179.
- Keiley, M. K., Lofthouse, N., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2003). Differential risks of covarying and pure components in mother and teacher reports of externalizing and internalizing behavior across ages 5 to 14. *Journal of Abnormal Child Psychology*, 31,

267–283.

- Krettenauer, T., Ullrich, M., Hofmann, V., & Edelstein, W. (2003). Behavioral problems in childhood and adolescence as predictors of ego-level attainment in early adulthood. *Merrill-Palmer Quarterly, 49*, 125–153.
- Kwok, O. M., Hughes, J. N., & Luo, W. (2007). Role of resilient personality on lower achieving first grade students' current and future achievement. *Journal of School Psychology, 45*, 61–82.
- Lahey, B. B., Rathouz, P. J., Keenan, K., Stepp, S. D., Loeber, R., & Hipwell, A. E. (2015). Criterion validity of the general factor of psychopathology in a prospective study of girls. *Journal of Child Psychology and Psychiatry, 56*, 415–422.
- Lee, E. J., & Bukowski, W. M. (2012). Co-development of internalizing and externalizing problem behaviors: Causal direction and common vulnerability. *Journal of Adolescence, 35*, 713–729.
- Lilienfeld, S. O. (2003). Comorbidity between and within childhood externalizing and internalizing disorders: Reflections and directions. *Journal of Abnormal Child Psychology, 31*, 285–291.
- Martel, M. M., Nigg, J. T., Wong, M. M., Fitzgerald, H. E., Jester, J. M., Puttler, L. I., ... & Zucker, R. A. (2007). Childhood and adolescent resiliency, regulation, and executive functioning in relation to adolescent problems and competence in a high-risk sample. *Development and Psychopathology, 19*, 541–563.
- Masten, A. S., Best, K. M., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology, 2*, 425–444.

- Muthén, B. (2000). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modeling: New developments and techniques* (pp. 1–33). Hillsdale, NJ: Erlbaum.
- Muthén, B., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research, 24*, 882–891.
- Muthén, L. K., & Muthén, B. O. (2012). MPlus: statistical analysis with latent variables--User's guide. Retrieved from: https://www.statmodel.com/html_ug.shtml
- Newman, D. L., Moffitt, T. E., Caspi, A., & Silva, P. A. (1998). Comorbid mental disorders: implications for treatment and sample selection. *Journal of Abnormal Psychology, 107*, 305–311.
- Nivard, M. G., Lubke, G. H., Dolan, C. V., Evans, D. M., Pourcain, B. S., Munafò, M. R., & Middeldorp, C. M. (2017). Joint developmental trajectories of internalizing and externalizing disorders between childhood and adolescence. *Development and Psychopathology, 29*, 919–928.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 535–569.
- O'Connor, E. E., Dearing, E., & Collins, B. A. (2011). Teacher-child relationship and behavior problem trajectories in elementary school. *American Educational Research Journal, 48*, 120–162.
- Oland, A. A., & Shaw, D. S. (2005). Pure versus co-occurring externalizing and internalizing symptoms in children: The potential role of socio-developmental milestones. *Clinical*

- Child and Family Psychology Review*, 8, 247–270.
- Rosenfield, S., & Mouzon, D. (2013). Gender and mental health. In *Handbook of the sociology of mental health* (pp. 277–296). Springer, Dordrecht.
- Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry*, 57, 316–331.
- Samaan, R. A. (2000). The influences of race, ethnicity, and poverty on the mental health of children. *Journal of Health Care for the Poor and Underserved*, 11(1), 100–110.
- Schwartz, G. (1978). Estimating the dimension of a model, *Annals of Statistics* 6: 461–464.
- Singer, J. D., Willett, J. B., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford University Press.
- Tsang, K. L. V., Wong, P. Y. H., & Lo, S. K. (2012). Assessing psychosocial well-being of adolescents: A systematic review of measuring instruments. *Child: Care, Health and Development*, 38, 629–646.
- Weeks, M., Wild, T. C., Ploubidis, G. B., Naicker, K., Cairney, J., North, C. R., & Colman, I. (2014). Childhood cognitive ability and its relationship with anxiety and depression in adolescence. *Journal of Affective Disorders*, 152, 139–145.
- Wiggins, J. L., Mitchell, C., Hyde, L. W., & Monk, C. S. (2015). Identifying early pathways of risk and resilience: The codevelopment of internalizing and externalizing symptoms and the role of harsh parenting. *Development and Psychopathology*, 27, 1295–1312.
- Woltering, S., & Shi, Q. (2016). On the neuroscience of self-regulation in children with disruptive behavior problems: Implications for education. *Review of Educational Research*, 86, 1085–1110.
- Woodcock, R. W., Mather, N., McGrew, K. S., Schrank, F. A., Johnson, M. B., & Wendling, B.

J. (2001). *Woodcock-Johnson III normative update: Tests of cognitive abilities*. Riverside Publishing.

Wu, J. Y., & Hughes, J. N. (2015). Teacher Network of Relationships Inventory: Measurement invariance of academically at-risk students across ages 6 to 15. *School Psychology Quarterly, 30*, 23–36.

4. CO-OCCURRING TRAJECTORIES OF INTERNALIZING AND EXTERNALIZING PROBLEMS FROM GRADES 1 TO 12: LONGITUDINAL ASSOCIATIONS WITH TEACHER-CHILD RELATIONSHIP QUALITY AND ACADEMIC PERFORMANCE*

4.1. Introduction

There is a substantial body of evidence that children's and adolescent's problem behaviors are associated with their academic progress and the quality of their relationships with teachers (O'Connor, Dearing, & Collins, 2011; Roorda, Verschueren, Vancraeyveldt, Van Craeyveldt, & Colpin, 2014; Van der Ende, Verhulst, & Tiemeier, 2016; Zimmermann, Schütte, Taskinen, & Köller, 2013). Problem behaviors are typically characterized by their internalizing (social withdrawal, anxiety, depression, and psychosomatic reactions) or externalizing (aggressive and disruptive behaviors, conduct and attention problems) symptomatology (Achenbach & Edelbrock; 1978; Achenbach, Ivanova, Rescorla, Turner, & Althoff, 2016; Kotov et al., 2017; Krueger & Markon, 2016). Applications of *child-driven* or *symptom-driven* models are predicated on the assumption that children's behavioral styles have a substantial impact on their interpersonal relationships and academic progress (O'Connor & McCartney, 2007; Gest, Welsh, & Domitrovich, 2005; Mejia & Hoglund, 2016; Sabol & Pianta, 2012). Consistent with these models, the adjustment erosion hypothesis posits that externalizing and internalizing symptoms predict subsequent academic problems and increase future vulnerability to symptoms in other domains (Deighton et al., 2018; Moilanen, Shaw, & Maxwell, 2010). Children who

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display problem behaviors are less likely to commit to school rules and norms, exhibit less motivation to succeed academically, and more likely to be disengaged from classroom and scholastic activities, impeding their ability to perform well academically (Van der Ende et al., 2016). In addition to studies which provide support for child- or symptoms-driven perspectives, there is also evidence that the associations between children's problem behaviors and academic performance are likely bidirectional or transactional across time (Metsäpelto, Zimmermann, Pakarinen, Poikkeus, & Lerkkanen, 2020; Zimmermann, Schütte, Taskinen, & Köller, 2013). Moreover, evidence garnered from several longitudinal studies suggests that there is a stronger association between externalizing problems, as opposed to internalizing problems, and academic performance (Vaillancourt, Brittain, McDougall, & Duku, 2013; Verboom, Sijtsema, Verhulst, Penninx, & Ormel, 2014; Zimmermann et al., 2013).

Among children and adolescents who exhibit problems behaviors, it is not uncommon for them to have co-occurring externalizing and internalizing problems (Capaldi, 1992; Oland & Shaw, 2005). Co-occurrence could be indicative of a general psychopathology factor (p-factor) characterized by the manifestation of both internalizing and externalizing symptoms (Caspi & Moffitt, 2018; Deutz et al., 2018) and represents low to high severity of psychopathology. Moreover, studies focusing on the etiological mechanisms associated with internalizing and externalizing problems indicate that they share several precursors including genetic or biological influences (Cosgrove et al., 2011), interpersonal or relational conflicts (Formoso, Gonzales, & Aiken, 2000; Rutter, 1989), and low self-regulation (Woltering & Shi, 2016), suggesting that some children may be particularly susceptible for developing co-occurring internalizing and externalizing problems. Empirical models examining direction-of-effect indicate that early externalizing problems are predictive of subsequent internalizing problems, and similarly, early

internalizing problems are predictive of externalizing problems (Granic, 2014; Lilienfeld, 2003; Patterson & Stoolmiller, 1991). Thus, transactional or bidirectional processes may be underlying co-occurring development across childhood and adolescence (Keiley, Bates, Dodge, & Pettit, 2000; Lee & Bukowski, 2012; Measelle, Stice, & Hogansen, 2006).

Despite the substantial amount of research in this area, there are several limitations. First, researchers typically distinguish internalizing and externalizing problems as distinct forms of problem behaviors, albeit the fact that many children with behavioral difficulties exhibit co-occurring internalizing and externalizing problems (Angold & Costello, 1993; Gilliom & Shaw, 2004; Krueger & Markon, 2006; Newman, Moffitt, Caspi, & Silva, 1998; Oland & Shaw, 2005). Second, much of the extant research on children's problem behaviors and academic outcomes has consisted of short-term longitudinal studies which have focused on samples of children in preschool and elementary school (Birch & Ladd, 1998; Mejia & Hoglund, 2016; Pianta, Steinberg, & Rollins, 1995). Consequently, long-term longitudinal studies (e.g., across the entire formal schooling period) may further contribute to our understanding of how children's problem behaviors have a sustained impact on their academic progression as children transition into adolescence. In light of these two limitations, the primary aims of the current study were to (1) investigate the co-occurring (i.e., joint) developmental trajectories of children's internalizing and externalizing problems from childhood through adolescence (i.e., grades 1 to 12), and (2) assess how these trajectories were associated with academic (math and reading) performance, and teacher-child relationship quality over time. With respect to the latter aim, we also investigated whether these associations varied before and after the middle school transition. We investigated these aims using data from a 12-year longitudinal study conducted with a sample of children who were predominately low-income, ethnically diverse, and academically at-risk.

4.1.1. Development of Internalizing and Externalizing Problems

As previously noted, most investigations on the development of internalizing and externalizing problems have examined them as distinct processes. With respect to externalizing problems, normative trends indicate a gradual decline from early childhood to late adolescence (Bongers, Koot, van der Ende, & Verhulst, 2003; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). With respect to internalizing problems, results from longitudinal studies have been mixed, with some studies indicating a gradual normative increase through adolescence (Achenbach, Howell, Quay, & Conners, 1991; Colder, Mott, & Berman, 2002; Costello et al., 2003; Gilliom & Shaw, 2004), and other studies indicating a decreasing or stable trend from childhood through adolescence (Gazelle & Ladd, 2003; Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003). In addition to normative trends, there is substantial heterogeneity (individual differences) in the development of children's internalizing and externalizing problems. Among studies that have examined heterogeneous developmental trajectories, investigators have consistently identified subgroups of children with chronically high levels of internalizing or externalizing problems (Broidy et al., 2003; Fanti & Henrich, 2007; Sterba, Prinstein, & Cox, 2007).

Expanding on these studies, several investigators have examined patterns of *co-occurring* or *joint* developmental trajectories which chart how children's internalizing and externalizing problems simultaneously develop and overlap over time (Chen & Simons-morton, 2009; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Nivard et al., 2017; Wiggins, Mitchell, Hyde, & Monk, 2015). Taken together, findings from these studies indicate four subtypes or classes have been most consistently identified: *pure-internalizing* (i.e., high stable/high-desisting internalizing and low externalizing problems), *pure-externalizing* (i.e., moderate/high stable externalizing and

low stable internalizing problems), chronic *co-occurring* (i.e., moderate/high stable internalizing and externalizing problems), and low-*risk* (i.e., low internalizing and externalizing problems).

Researchers have proposed that children with co-occurring (internalizing and externalizing) problems may display a more severe profile of emotional and behavioral difficulties compared to children with pure externalizing or internalizing problems (Keiley et al., 2003; Newman et al., 1998; Oland & Shaw, 2005). For instance, Fanti and Henrich (2010) reported that children and adolescents with chronic co-occurring problems were at greater risk for engaging in risky behaviors (i.e., delinquency) and experiencing social problems with peers (i.e., association with deviant peers, peer rejection, and social avoidance). Considering the potentially severe consequences of co-occurring externalizing and internalizing problems, and the fact that they often co-occur, it is critical to investigate the joint development of these problem behaviors, in addition to how they develop independently. However, to my knowledge, there have been no published long-term longitudinal studies that have investigated the dynamic associations between children's co-occurring problem behavior trajectories and their scholastic performance or adjustment. Thus, additional longitudinal research is warranted, and the current study sought to investigate the extent to which children's pure and co-occurring internalizing and externalizing problems were associated with two facets of their scholastic adjustment; their teacher-child relationship quality and academic (i.e., math and reading) performance.

4.1.2. Teacher-Child Relationship Quality

Conceptualizations of teacher-child relationship quality have typically differentiated its multiple dimensions, and the two most commonly assessed dimensions include teacher-child warmth (also referred to as closeness) and conflict (Birch & Ladd, 1998; Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012; Pianta, 1994; Pianta & Steinberg, 1992; Pianta, Steinberg, &

Rollins, 1995). Teacher-child warmth has been characterized by relationships which are supportive, mutually responsive, and high in positive affect and emotional closeness. In contrast, teacher-child conflict reflects relationships that are discordant and unresponsive, and high in negative affect and hostility (O'Connor et al., 2011).

Several investigators have attempted to examine the direction of effect between teacher-child relationship quality and children's problem behaviors. Mejia and Hoglund (2016) examined competing models reflecting child-driven effects (i.e., problem behaviors predicting teacher-child conflict and warmth), relationship-driven effects (teacher-child relationship quality predicting problem behaviors) and transactional effects. Their findings primarily supported a child-driven model over the competing models, suggesting that problem behaviors are a stronger contributor to teacher-child relationship quality, than the reverse direction of effect. In contrast to these findings, other investigators have theorized that these associations are likely bidirectional or transactional in nature (Doumen et al., 2008; Ly & Zhou, 2018; Skalická, Belsky, Stenseng, & Wichstrøm, 2015; Wentzel, 2002). According to this viewpoint, it is possible that children and teachers may get caught in a vicious cycle of deteriorating teacher-child relationship quality and escalating child problem behaviors (Sutherland & Oswald, 2005). That is, problem behaviors may undermine teacher-child relationship quality, which in turn, may further exacerbate children's problem behaviors. Similarly, several longitudinal studies provide evidence that a warm and supportive teacher-child relationship has positive effects on students' behavioral and academic adjustment and this effect may be stronger in the early school years than in later years (O'Connor & McCartney, 2007; Hamre & Pianta, 2001; Hughes et al., 2008).

Taken together, one implication of this area of research is that children's problem behaviors and their teacher-child relationship quality may function to reinforce each other across

time. However, there may be differences with respect to the forms of problem behavior and teacher-child relationship quality. For instance, externalizing problems have been found to be more strongly associated with teacher-child conflict than warmth or closeness (Nurmi, 2012; Silver, Measelle, Armstrong & Essex, 2005). In contrast, internalizing problems have been hypothesized to be more strongly, and negatively, associated with teacher-child warmth (Murray & Murray, 2004). Notably, studies pertaining to this area of research have primarily examined externalizing and internalizing problems independently, highlighting different underlying processes. With respect to externalizing problems, it has been postulated that disruptive, hyperactive classroom behaviors and inattentiveness increase children's classroom disciplinary problems, and thereby increase conflict with teachers. With respect to internalizing problems, children who exhibit social anxiety and withdrawn behaviors are also likely to endorse avoidance motivations, which may reduce their opportunities to participate actively in the classroom and form close and supportive relationships with teachers. Presumably, children with co-occurring problems are likely to exhibit both disruptive behaviors and social avoidance, which in combination may exacerbate their risks for having maladaptive relationships with teachers. Consequently, we hypothesized that compared to children with low levels of problem behaviors, and those with pure internalizing or externalizing problems, children with chronic co-occurring problem behavior trajectories would experience higher levels and more persistent teacher-child conflict, and consistently lower levels of teacher-child warmth over time.

From a developmental perspective, longitudinal studies consistently indicate a normative decline in teacher-child warmth across the elementary school years (see Jerome, Hamre, & Pianta, 2009; O'Connor et al., 2011; Wu & Hughes, 2015). Building on these findings, we expected that children with co-occurring problems would not only exhibit persistently lower

levels of teacher-child warmth (i.e. intercept differences), but would also have the most pronounced (steepest) decline in teacher-child warmth over time (i.e. slope differences).

Research on normative developmental trends in teacher-child conflict have been less consistent. On the one hand, there is some evidence that teacher-child conflict may exhibit a non-linear developmental pattern characterized by increases in the early grades followed by declines towards the end of elementary school (Jerome et al., 2009). On the other hand, a study conducted using the same longitudinal sample as the current study found that teacher-child conflict steadily declined across the elementary and middle school years (Wu & Hughes, 2015). Expanding on these findings, we expected that children with co-occurring problems would be the least likely to exhibit normative declines in teacher-child conflict over time, and were at greater risk for maintaining higher levels of conflict, even as they matured.

Findings from a recent study also indicate that normative developmental trends in teacher-child relationship quality are impacted by the middle-school transition (Hughes & Cao, 2018). More specifically, these investigators reported that teacher-child warmth (but not conflict) exhibited a significant decline after students made the transition to middle school. This decline could be attributed to some of the new challenges that adolescents face as they transition to middle school. That is, for many children, the transition to middle school is occurring at a time when they are also experiencing considerable biological, cognitive, and social maturation, including pubertal development, increasing autonomy, relying less on parents, and spending greater amounts of time with peers (Dahl, 2004). In addition to these individual changes, the middle school transition also introduces more rigorous academic demands and emphasis on instruction and performance, as well as having multiple teachers, collectively resulting in less time and fewer opportunities to interact, and form supportive relationships with teachers.

Applying stage-environment fit theory (Eccles et al., 1993), researchers have postulated that these environmental changes relating to the middle school context create a misfit with their individual and developmental needs. Consequently, in examining the development of teacher-child relationship quality among the problem-behavior trajectory subgroups, we also assessed whether there were developmental variations before and after the middle school transition, and hypothesized that there may be greater declines in teacher-child relationship quality during the secondary school years.

4.1.3. Academic Performance

In addition to research on teacher-child relationship quality, there has been substantial interest among investigators in examining the associations, and potential direction of effect, between children's problem behaviors and academic performance. For instance, using variable-centered approaches such as full-panel cross-lagged models, several studies have consistently found that externalizing problems are prospectively associated with lower academic performance (Burt & Roisman, 2010; Chen, Huang, Chang, Wang, & Li, 2010; Defoe, Farrington, & Loeber, 2013; Esch et al., 2014; Kremer, Flower, Huang & Vaughn, 2016; Masten et al., 2005; Metsäpelto et al., 2015; Moilanen et al., 2010; van Lier et al., 2012), and there is also support for prospective associations from internalizing problem to lower academic performance (Obradović, Burt, & Masten, 2010; Verboom et al., 2014). Taken together, these results are consistent with the adjustment erosion hypothesis, according to which problem behaviors are believed to undermine children's academic performance. Investigators have also proposed the academic incompetence hypothesis, which considers the reverse direction of effect, such that poor academic performance contributes to the development of problem behaviors (Lee, 2013; Metsäpelto et al., 2020). However, findings with respect to this direction of effect have been less

consistent, and it appears that the academic incompetence hypothesis has received relatively less empirical support than the adjustment erosion hypothesis (Burt & Roisman, 2010; Moilanen et al., 2010; Van der Ende, et al., 2016). Nonetheless, these alternative hypotheses imply that there are potential bidirectional and transactional associations between problem behaviors and academic performance and that functioning in one domain may influence functioning in the second domain in a reciprocal way (Masten & Cicchetti, 2010).

There also appear to be differences with respect to the forms of problem behavior and academic performance. Among studies that have examined the potential additive effects of externalizing and internalizing problems, externalizing problems are more consistently detrimental for children's academic performance than internalizing problems (Deighton et al., 2017; Esch et al., 2014; Moilanen et al., 2010; Van der Ende et al., 2016). These findings are consistent with the viewpoint that effects of externalizing and internalizing problems on academic performance may involve distinct underlying processes. Externalizing problems appear to lead to more classroom based disciplinary problems, and interpersonal difficulties with teachers and classmates (e.g., peer rejection), which may reduce and interfere with learning opportunities (Chen, Rubin, & Li, 1997; Schwartz, Gorman, Nakamoto, & McKay, 2006). In contrast, internalizing problems appear to compromise cognitive functioning, decrease academic motivations and self-efficacy which may have adverse effects on school performance (Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003; Roeser, Van der Wolf, & Strobel, 2001). Moreover, researchers have evaluated the proposition that the associations between internalizing problems and academic difficulties are more pronounced in low-income and ethnic-minority children, however, the empirical support pertaining to this proposition has been mixed (see Grover, Ginsburg, & Ialongo, 2007; Moilanen et al., 2010; Roeser et al., 2001).

It is important to note that these conclusions have been drawn primarily from variable-centered studies, which focus on examining main (i.e., independent) and additive effects of externalizing and internalizing problems, rather than considering the potential impact of co-occurring problems. Thus, it remains unclear whether children with co-occurring problem behavior trajectories exhibit poorer academic performance compared to children with low levels of problem behaviors, or those with pure internalizing or externalizing problems. In the current study, we consider two alternative hypotheses. On the one hand, in light of the evidence that externalizing problems are more strongly associated with academic performance than internalizing problems, it is possible that children with co-occurring problem behavior trajectories *and* those with pure externalizing trajectories are at greater risk for lower academic performance. On the other hand, co-occurring problem behaviors may represent a unique symptomology that may undermine children's academic performance in multiple ways. Thus, children who exhibit both forms of problem behaviors may be particularly susceptible to lower academic performance in comparison to those who exhibit primarily externalizing *or* internalizing behaviors.

Similar to its potential impact on teacher-child relationship quality, the transition to middle school may also have an influence on children's academic performance. That is, to the extent that this transition introduces additional stressors and misalignment between children's individual needs and their scholastic context, it may undermine their academic performance (Eccles & Roeser 2011). Moreover, it is plausible that children with academic, behavioral, and socioeconomic risks are more likely to be negatively impacted by this transition. Consistent with this viewpoint, the negative association between externalizing behaviors and academic performance has been found to be more pronounced during important transitional periods,

including the transition to middle school (Moilanen et al., 2010). Findings from a recent study also indicated that internalizing problems were more detrimental for students' academic performance in secondary school compared to elementary school (Deighton et al., 2018). Building on these findings, we hypothesized that the effects of co-occurring problem behaviors on academic performance are likely to be exacerbated after the transition to middle school (i.e., in the secondary school years).

4.1.4. The Current Study

This study had two primary aims. Aim 1 was to examine the joint development of children's externalizing and internalizing problems from grades 1 to 12 in order to identify subgroups (i.e., classes) of children with heterogeneous developmental trajectories. Consistent with prior evidence, we expected to identify four distinct trajectory groups: (1) *pure-internalizing*, (2) *pure-externalizing*, (3) *co-occurring*, and (4) *low-risk*. For each subgroup identified in Aim 1, Aim 2 was to examine the development (i.e., continuity and changes) of their teacher-child relationship quality (teacher-child conflict and warmth from grades 1 to 12) and academic performance (math and reading performance from grades 1 to 9). Expanding on this second aim, we also investigated whether each subgroup's teacher-child relationship quality and academic performance trajectories varied before and after the transition to middle school.

4.2. Method

4.2.1. Participants

Participants were part of a larger 12-year longitudinal study, called "Project Achieve", which followed them from grades 1 to 12. The sample included 784 students (47% girls), recruited from one urban and two small city school districts in the state of Texas, in the fall of 2000 (cohort 1, N=449) and 2001 (cohort 2, N=335). Students were selected into the study if

they scored below the median on a district-administered literacy test in the spring of kindergarten or the fall of grade 1. Additional inclusionary criteria for participating in the study included speaking English or Spanish, not receiving special education services other than speech and language services, and not having been retained previously in grade 1. A total of 1374 first-graders were eligible to participate and provided parental consent forms, of which 1200 consent forms were returned, and 784 parents agreed to have their children participate. Chi-square tests indicated that there were no significant differences between the eligible participants with and without parental consent on literacy test scores, age, gender, ethnicity, family income, bilingual class placement, and cohort (see additional details on sampling procedures in Hill & Hughes, 2007). During the first assessment year (grade 1), the average age (in years) of the sample was 6.57 ($SD = 0.38$). About 65% of participants qualified by income for free or reduced lunch (an index of low socioeconomic status), and 42.5% had parents with a high school diploma or less educational attainment. The sample was ethnically diverse: 34.1% was White, 23.2% African American, 37.4% Latino or Hispanic, 3.6% Asian or Pacific Islander, and 1.8% other. Almost all children made the transition to middle school beginning in grade 5 or 6 (24% and 75%, respectively).

4.2.2. Procedure

This study incorporated a multi-method, repeated measures research design. More specifically, participating school districts provided the research team with information on participants' demographic background including age, gender, ethnicity, and eligibility for free or reduced-price lunch. Annually (from grades 1 to 9), students' reading and math academic performance was assessed by the use of a standardized test administered to students by trained research staff. Annually (in the spring of each year from grades 1 to 12) teachers completed

questionnaires to measure students internalizing and externalizing problems, and their relationship quality with students (note that no assessments were collected in grade 11). Students' primary teacher completed the questionnaires when they were in the elementary school grades, and their language arts teacher or a teacher (named by the language arts teacher) who had more knowledge of the student filled out the teacher questionnaire in subsequent grades. The choice of relying on language arts teachers was based primarily on the rationale that all students were required to take language arts courses annually, and would be evaluated in a similar instructional context as other participants. Across grades 1 to 12 (see Table 4-1), there were, on average, 243.3 teachers (ranging from 148 – 335) from 72 schools (ranging from 36 – 108) participating in data collection. Across grade levels, most teachers were female (70.1%-98.3%) and White (76.7%-86.4%), with smaller percentages of Hispanic (1.1%-16.1%) and African American teachers (2.0%–16.8%). About 33.2% to 67.8% teachers had Bachelor's degrees and 12.8% and 43.5% teachers had master degree. About 13.1%-28.8% teachers had less than three years of teaching experience, 10.4%-28.9% had 4-6 years of experience, 14.6%-30.9% had 7 to 12 years of teaching experience, and 25.9% -47.2% had more than 12 years of teaching experience. Teachers spent 1.1 to 6.3 hours with their students on a daily basis, with the amount of time spent with each student declining in secondary school. There were various types of certifications teachers had received including Early Childhood (0.2%-39.3%), Elementary (5.7%-94.8%), Bilingual/ESL (10.5%-33.0%), Special Education certificate (4.2%-9.0%), and Gifted/Talented (19.9%-36.1%).

Table 4-1. Descriptive Statistics for Teachers in Each Grade

Grade	1	2	3	4	5	6	7	8	9	10	12
Gender and Ethnicity (%)											
Female	98.3	96.1	94.4	93.7	88.5	96.4	96.1	89.8	84.5	73.0	70.1
White	80.6	82.7	82.5	77.4	76.7	80.9	82.0	87.2	78.4	79.0	86.4
Hispanic	15.2	13.1	13.9	16.1	12.5	4.1	1.8	1.1	1.3	2.4	2.8
Black	2.1	2.9	2.0	4.3	6.2	11.6	11.6	8.5	15.8	16.8	9.8
Other	2.1	1.4	1.4	2.2	4.6	3.4	4.6	3.2	4.5	1.9	1.0
Highest Degree (%)											
Bachelor's degree	42.1	59.3	54.7	58.8	54.2	62.7	67.8	63.4	62.6	51.8	33.2
Some post-bachelor graduate coursework	30.9	24.0	23.3	19.6	24.9	19.9	11.4	19.2	14.2	12.5	17.3
Master's degree	22.5	15.2	18.6	17.7	17.8	12.8	18.9	16.3	21.6	31.2	43.5
Master's degree plus additional graduate coursework	4.5	1.5	3.4	3.9	3.1	4.5	1.8	1.1	1.5	4.5	6.0
Years of Experience (%)											
3 or fewer years	28.8	23.9	24.7	24.6	21.1	27.0	26.5	26.3	25.9	17.8	13.1
4-6 years	10.4	23.8	17.9	20.5	18.3	19.7	15.8	12.7	23.7	28.9	11.7
7-12 years	14.6	16.3	20.6	19.9	24.0	27.4	15.0	19.1	23.2	26.3	30.9
more than 12 years	47.2	36.0	36.8	34.9	36.6	25.9	42.7	41.9	27.2	27.0	44.4
Years teacher had taught in current school (%)											
3 or fewer years	54.8	51.0	49.4	56.2	46.0	51.2	55.9	54.3	53.1	46.3	22.4
4-6 years	13.8	26.3	21.1	22.9	25.3	24.6	18.9	16.9	25.7	33.6	27.6
7-12 years	17.2	9.9	17.3	10.1	16.0	11.6	9.8	10.8	12.8	12.1	24.3
more than 12 years	14.2	12.8	12.2	10.8	12.8	12.6	15.3	18.0	8.4	8.0	25.7
Years teacher had taught in current grade											
3 or fewer years	51.1	55.1	50.2	54.4	45.8	43.0	38.6	40.8	45.2	37.4	28.5
4-6 years	16.2	18.4	19.5	20.7	20.0	30.8	20.3	18.9	32.1	28.1	26.2
7-12 years	15.2	11.5	21.8	14.9	16.3	12.0	17.1	16.9	8.7	14.6	27.6
more than 12 years	17.5	11.9	8.5	10.3	17.9	14.1	24.0	23.4	14.0	19.9	17.8
Hours spend with student on daily basis											
Mean (SD)	6.3 (1.1)	6.1 (1.3)	5.6 (1.7)	5.0 (1.9)	3.8 (2.0)	2.2 (1.2)	1.5 (0.7)	1.2 (0.5)	1.1 (0.5)	1.2 (0.7)	N/A
Range	7.0	7.0	7.0	7.0	7.0	7.0	5.0	5.0	5.0	5.0	
Types of certification (%)											
Early childhood	39.3	37.2	21.1	24.4	17.4	8.4	6.2	4.9	3.6	0.2	7.9
Elementary	94.8	94.6	91.7	86.0	83.3	67.2	36.1	23.9	8.9	5.7	7.5
Bilingual/ESL	22.0	29.6	32.1	31.3	33.0	26.6	18.9	17.4	10.7	10.5	12.6
Special education	5.9	5.5	6.7	4.7	2.6	8.6	7.3	7.1	4.8	9.0	4.2
Gifted/Talented	19.9	22.1	30.5	33.4	24.4	32.4	32.4	33.0	36.1	32.2	35.0

4.3. Measures

4.3.1. Externalizing and Internalizing Problems

Each year (from grades 1 to 12), externalizing and internalizing problems were measured with the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001), a 25-item teacher report measure. Teachers responded to each item using a 3-point Likert-scale (0 = *not true*, 1 = *somewhat true*, 2 = *certainly true*). The SDQ has been widely used in educational research, and extensively validated to measure children and adolescents' problem behaviors (Goodman & Scott, 1999; Goodman, Lamping, & Ploubidis, 2010; Hill & Hughes, 2007). Externalizing problems were assessed based on the average score of 10 items combined from the Conduct Problems scale (5 items: e.g., often fights, lies or cheats, steals from home, school or elsewhere, has temper tantrums) and the Hyperactivity-Inattention scale (5 items: e.g., restless, overactive, fidgeting or squirming). This scale had adequate reliability across time (alphas ranged from .86 to .90). Although these subscales reflect distinct dimensions of externalizing problems, they were highly correlated in the current sample (r s ranged from 0.59 to 0.65), and the decision was made to assess children's externalizing problems broadly, as opposed to focusing on its more specific forms or dimensions. Internalizing problems were assessed based on the average score of 5 items from the Emotional Symptoms scale (e.g., complains of headaches, many worries, unhappy, nervous or clingy). This measure had adequate reliability across time (alphas ranged from .70 to .81). Notably, the SDQ also includes a peer problems subscale as part of the internalizing scale, however, the decision was made to exclude these items based on several reasons. First, although emotion and peer problems reflect distinct constructs, many investigators have argued that they are interrelated and prospectively associated with each other (Hymel, Rubin, Rowden, & LeMare, 1990; Reijntjes, Kamphuis, Prinzie, & Telch, 2010). Second, there is considerable

evidence that peer problems also co-occur with externalizing problems (Ettekal & Ladd, 2017; 2020), thus obfuscating the rationale for including these types of symptoms with the internalizing problems scale. Third, a comparison of the SDQ items with other widely validated measures of internalizing problems (e.g., the Child Behavior Checklist; CBCL; Achenbach, 1991) indicated that the emotion problems items appeared to align more closely than did the items from the peer problems subscale, and were more reflective of symptoms of depression and anxiety which typically characterize internalizing problems.

Confirmatory factor analyses were performed on the 10-item externalizing problems and 5-item internalizing problems. Results indicated that these measurement models demonstrated sound psychometric properties and adequate model fit (see Table S1). Furthermore, longitudinal measurement invariance tests were performed to assess models with configural, metric, and scalar invariance. Because the chi-square difference test is sensitive to larger sample sizes, methodologists have recommended examining changes in RMSEA and CFI, particularly when sample sizes exceed 300 cases (see Chen, 2007). More specifically, when $\Delta\text{RMSEA} \leq .015$ and $\Delta\text{CFI} \leq .01$, conditions for different levels of measurement invariance have been met (Chen, 2007). Using this criteria, it appeared that both scales exhibited metric invariance and the externalizing measure approached scalar invariance (see Table S2). Although the current study utilized continuous scores to measure children's problem behaviors, the SDQ manual (retrieved from <https://sdqscore.org/>), also includes a categorization scheme to identify children with varying severity of problem behaviors (referred to as the *newer four-brand categorization* in the manual). Using this categorization method, it appeared that the current sample exhibited higher rates of problem behaviors, particularly during the earlier grades and for externalizing problems, compared to a large normative community sample. More specifically, in comparison to 5% of

children categorized as having “very high” rates of problem behaviors in normative samples, about 6.7% to 14.5% of the current sample was categorized as having “very high” conduct problems, 5.9% to 16.1% had “very high” levels of hyperactivity, and 3.2% to 8.5% had “very high” levels of emotion problems (see Table S3).

4.3.2. Teacher-child Relationship

Each year (from grades 1 to 12), teachers completed the 22-item Teacher Relationship Inventory (TRI; Furman & Buhrmester, 1985) which assessed the quality of their relationships with students using a 5-point Likert scale (1 = *not true*, 5 = *certainly true*). For the purposes of the present study, two subscales from the TRI were used: *Warmth* (13 items; e.g., ‘I enjoy being with this child’; ‘This child gives me many opportunities to praise him or her’), and *Conflict* (6 items; e.g., ‘This child and I often argue or get upset with each other’; ‘I often need to discipline this child’). Both subscales exhibited adequate internal consistency across the 12 years (alphas ranged from 0.94–0.96 for Warmth and from 0.91–0.94 for Conflict). These subscales have demonstrated adequate psychometric properties, and have been validated in previous studies by researchers using this dataset (see Wu & Hughes, 2015). More specifically, these researchers established that these subscales demonstrated strong measurement invariance across gender and race/ethnicity, as well as longitudinal invariance in childhood and adolescence. Thus, these subscales are appropriate for examining age-related changes in teacher-student relationship quality across the formal schooling years.

4.3.3. Academic Performance

Each year (from grades 1 to 9), academic performance was assessed by the Woodcock-Johnson Tests of Achievement Third Edition (WJ-III ACH; Woodcock, McGrew, & Mather, 2001). In the present study, age-standardized scores were computed using the WJ-III

Compuscore and profile program, based on children's composite Broad Reading W scores (consisting of Letter-Word Identification, Reading Fluency, and Passage Comprehension) and Math scores (consisting of Calculations, Math Fluency, and Math Calculation Skills). If children or their parents spoke any Spanish, children were administered the Woodcock–Muñoz Language Survey (Woodcock & Muñoz-Sandoval, 1993) to determine the child's language proficiency in English and Spanish and selection of either the WJ-III or the Bateria–R. The Bateria Woodcock–Muñoz: Pruebas de Aprovechamiento—Revisada (Bateria–R; Woodcock & Muñoz-Sandoval, 1996) is the comparable Spanish version of the Woodcock-Johnson Psycho-Educational Battery—Revised (WJ–R; Woodcock & Johnson, 1990). The Woodcock Compuscore program (Woodcock & Muñoz-Sandoval, 2001) yields *W*-scores for the Bateria–R that are comparable to *W*-scores on the WJ–R. About 12.4% completed the Spanish version in grade 1, 12.7% in grade 2, 12.1% in grade 3, 10.8% in grade 4, 9.6% in grade 5, 5.0% in grade 6, 3.7% in grade 7, 2.8% in grade 8, and 2.1% in grade 9. Both the English and Spanish versions of this assessment have been used extensively in educational research and have well-established reliability and validity (Woodcock et al., 2001).

Although the current study utilized continuous scores to measure children's reading and math performance, the Woodcock-Johnson manual (Woodcock et al., 2001) also includes a categorization scheme which provides a breakdown of children's academic performance (e.g., above, at, and below average) in comparison with normative samples. Using this categorization scheme (see Table S4), the results indicated that 28%-35% of participants had reading scores below average (i.e., low-average, low and very low), and 15%-32% had math scores below average. Taken together, these findings indicated that children were more at-risk with respect to their reading performance than math performance, particularly in earlier grades.

4.3.4. Covariates

4.3.4.1. Family Socioeconomic Adversity

Based on both school records and parents' reports, family socioeconomic (SES) adversity was calculated as the mean of the standardized scores on five domains: eligibility for free or reduced lunch (coded 0-1; 1 = *yes*), single parent status (coded 0-1; 1 = *yes*), rental status (coded 0-1; 1 = *yes*), the highest occupational level of any adult in the home (coded 1-9; e.g., 9 = *farm laborers/mental service workers*; 5 = *clerical and sales work*; 1 = *higher executives, proprietors of large businesses*), and the highest education level of any adult in the home (coded 1-10; e.g., 10 = *elementary school*; 5 = *some college education*; 1 = *Ph.D., MD, or equivalent*). A higher score represented experiencing more family SES adversity.

4.3.4.2. Kindergarten Literacy Skills

Kindergarten literacy skills were measured with the Texas Essential Knowledge and Skills test (TEKS; Texas Education Agency, 2004). This state-approved test was required by school districts to assess the literacy skills of students, and in order to identify and provide remedial instruction to students who failed to demonstrate grade-level literacy competencies.

4.3.4.3. Intelligence

The abbreviated version of the Universal Nonverbal Intelligence Test (UNIT) is a measure of general intelligence that evaluates children's memory and reasoning. The UNIT is administered using nonverbal gestures and has been found to be less culturally and linguistically biased than verbal measures (Bracken & McCallum, 1998).

4.4. Analysis Plan

All analyses were performed in Mplus version 7.4 (Muthén & Muthén, 2012), using full information maximum likelihood with robust standard error (MLR) estimation. First, parallel

process growth mixture models (GMMs) were performed to classify children into distinct classes based on their co-occurring internalizing and externalizing trajectories from grades 1 to 12. GMMs were specified with varying numbers of classes (i.e., 2 to 6 classes), and for each model, model fit was assessed using a combination of fit indices including the Akaike information criterion (AIC), Bayesian information criterion (BIC), sample size-adjusted Bayesian information criterion (SSABIC), bootstrap likelihood ratio test (BLRT), and entropy (Nylund, Asparouhov, & Muthén, 2007). Smaller values on the AIC, BIC, and SSABIC are indicative of better model fit (Schwartz, 1978). A nonsignificant BLRT statistic suggests that a model with one fewer class is preferred (Nylund et al., 2007). An entropy value greater than .70 is indicative of a model with adequate classification precision (Muthén, 2000). In addition to examining these fit indices, the qualitative nature of the classes was assessed to ascertain that they were conceptually meaningful and interpretable. Initially, GMMs were specified using a quadratic latent factor to assess non-linear growth, however, quadratic effects were consistently small and not statistically significant. Therefore, this factor was removed and results are presented for the more parsimonious linear growth models.

Second, sequential latent growth models were specified to examine the development of children's teacher-child relationship quality (i.e., conflict and warm) and academic (i.e., reading and math) performance trajectories before and after the transition to middle school (i.e., from grades 1 to 5 and 6 to 12). These sequential growth models were conditional on children's class identification (i.e., class assignments) derived from the GMMs (specified in Aim 1). This approach allowed us to evaluate the extent to which children's co-occurring problem behaviors were associated with variations (i.e., continuity and changes) in their scholastic adjustment (i.e., math and reading performance, and teacher-child conflict and warmth) over time. Moreover,

these models also included gender, ethnicity, early family socioeconomic adversity, early language ability, and early intelligence scores (mean-centered) as covariates in order to evaluate the effects of children's co-occurring problem behaviors controlling for other potential confounding variables.

4.5. Results

4.5.1. Missing Data Analyses

The rates of missing data, for all study variables, increased over time (see Table 4-2 for the sample sizes at each wave). To assess whether the data were missing completely at random (MCAR), a Little's MCAR test was performed using all of the study variables (including covariates), and the result was not statistically significant ($\chi^2(14572) = 14847.363, p = .054$). Although this omnibus test was not statistically significant at $p < .05$, indicating that the MCAR assumption may have been met, because it approached statistical significance, additional analyses were performed to further investigate patterns of missing data. More specifically, a series of univariate t-tests and chi-square tests were performed to examine whether there were any observable causes of missing data on the teacher-child relationship, academic performance, and problem behavior measures over time. These analyses assessed whether missing data or attrition was associated with children's intelligence, early literacy skills, family socioeconomic adversity, gender, and ethnicity. Results indicated that girls were more likely to have missing data on the measures of teacher-child relationship quality, internalizing problems and externalizing problems at grade 7 and on academic performance at grades 7 and 8. African Americans were more likely to have missing data on teacher-child relationship quality, internalizing problems and externalizing problems only at grade 3. However, missing data and attrition were not associated with intelligence, early literacy skills, and family socioeconomic

adversity. Additional analyses were performed to assess whether attrition was associated with early levels of teacher-child relationship quality, academic performance, and problem behaviors, and results indicated that students who had dropped out of the study in grade 12 were more likely to be high in grade 1 externalizing problems, but the effect size was small, and no other significant associations were found. Missing data and attrition were handled in Mplus using full information maximum likelihood (FIML) estimation, an approach that provides unbiased parameter estimates under conditions of MCAR or missing at random (Enders, 2010). With this approach, all participants were included in the analyses (N=784), even if they had missing data, or dropped out of the study at some point.

4.5.2. Descriptive Statistics and Bivariate Correlations

Descriptive statistics are reported in Table 4-2. Results indicated that there were mean level decreases in internalizing and externalizing problems, teacher-child warmth, and conflict from grades 1 to 12. On average, children exhibited a higher initial (grade 1) score on math, compared to reading performance, however, math performance appeared to decrease in later grades. Bivariate correlations among the study variables are reported in the supplemental files (Table S5). The bivariate correlations indicated that math and reading achievement were highly positively correlated. Teacher-child conflict and warmth were moderately negatively correlated. The internalizing and externalizing problems were also moderately positively correlated.

Table 4-2. Descriptive Statistics (Range, Observed Means, and Standard Deviations) and Scale Reliabilities for Internalizing and Externalizing Problems, Teacher-child Warmth and Conflict, and Reading and Math Academic Performance

<i>Variables</i>	<i>Grade</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>a</i>		<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>a</i>
Problem behaviors														
Internalizing	1	677	0.39	0.42	0.00	2.00	0.73	Externalizing	675	0.62	0.51	0.00	2.00	0.89
	2	621	0.35	0.41	0.00	2.00	0.71		619	0.58	0.51	0.00	2.00	0.89
	3	547	0.34	0.39	0.00	2.00	0.70		547	0.60	0.50	0.00	2.00	0.89
	4	528	0.38	0.45	0.00	2.00	0.77		528	0.57	0.49	0.00	2.00	0.88
	5	541	0.32	0.43	0.00	2.00	0.78		541	0.54	0.49	0.00	2.00	0.90
	6	439	0.25	0.39	0.00	2.00	0.79		439	0.53	0.49	0.00	2.00	0.90
	7	430	0.23	0.34	0.00	2.00	0.74		430	0.52	0.46	0.00	1.90	0.88
	8	437	0.19	0.32	0.00	2.00	0.74		437	0.48	0.44	0.00	2.00	0.88
	9	406	0.21	0.35	0.00	2.00	0.77		406	0.45	0.39	0.00	1.70	0.86
	10	436	0.24	0.39	0.00	2.00	0.81		435	0.47	0.42	0.00	1.80	0.87
	12	390	0.21	0.34	0.00	2.00	0.77		390	0.42	0.41	0.00	1.80	0.88
	Teacher-child relationship													
Warmth	1	699	4.01	0.81	1.00	5.00	0.95	Conflict	702	1.88	1.02	1.00	5.00	0.92
	2	623	3.93	0.85	1.08	5.00	0.95		623	1.84	1.00	1.00	5.00	0.92
	3	547	3.94	0.85	1.15	5.00	0.96		547	1.79	0.95	1.00	5.00	0.92
	4	528	3.90	0.88	1.15	5.00	0.95		528	1.74	0.91	1.00	5.00	0.91
	5	541	3.85	0.86	1.00	5.00	0.94		541	1.73	0.92	1.00	5.00	0.93
	6	439	3.74	0.95	1.31	5.00	0.96		439	1.67	0.93	1.00	5.00	0.94
	7	430	3.59	0.96	1.08	5.00	0.96		430	1.66	0.96	1.00	5.00	0.94
	8	438	3.44	1.01	1.00	5.00	0.96		438	1.61	0.87	1.00	4.67	0.92
	9	406	3.53	0.92	1.00	5.00	0.95		406	1.55	0.79	1.00	5.00	0.92
	10	436	3.52	0.91	1.00	5.00	0.95		436	1.56	0.82	1.00	5.00	0.93
	12	390	3.49	0.93	1.08	5.00	0.95		391	1.47	0.79	1.00	4.75	0.92
	Academic performance													
Reading	1	757	96.49	18.05	44.00	159.00	0.98	Math	756	100.79	14.34	38.00	148.00	0.96
	2	687	96.86	17.07	46.00	149.00	0.98		687	100.40	12.82	54.00	147.00	0.94
	3	668	95.44	14.15	39.00	145.00	0.97		668	100.62	12.38	56.00	136.00	0.92
	4	664	95.07	13.45	43.00	153.00	0.96		663	100.80	12.05	46.00	135.00	0.94
	5	647	95.73	13.24	44.00	155.00	0.95		646	100.04	11.56	47.00	139.00	0.93
	6	542	95.57	13.76	39.00	167.00	0.92		541	99.21	11.53	52.00	138.00	0.93
	7	513	95.83	13.96	39.00	144.00	0.92		513	98.13	12.13	50.00	142.00	0.93
	8	504	96.56	14.78	47.00	154.00	0.92		503	97.12	12.58	47.00	154.00	0.94
	9	487	97.22	15.63	45.00	161.00	0.96		484	94.45	13.03	40.00	154.00	0.95

4.5.3. Co-occurring Internalizing and Externalizing Trajectories

Model fit indices for the joint trajectory models are reported in Table 4-3. Across models with 2- to 6 classes, the results indicated that , the AIC and BIC scores decreased as the number of classes increased, entropy values were consistently high (above .80), and the BLRT was statistically significant across all models. Although the fit indices improved with the inclusion of additional classes, after examining the classes identified in each model (i.e., plotting the class-specific means), the four-class model was selected as the optimal solution. This model identified four conceptually meaningful and interpretable classes and served as the most parsimonious solution. Specifically, on and above the 3-class model, the 4-class model identified an additional pure-externalizing class that characterized children and adolescents who were high on externalizing problems but exhibited lower rates of internalizing problems. Moreover, when comparing the 4- and 5-class models, the 5-class model essentially identified two low-risk classes and the additional trajectory class (relatively small with about 7% of children) was not qualitatively distinct from the classes identified in the 4-class model. Moreover, the models with 5- and 6-classes appeared to have some convergence problems (i.e., perturbed starting values).

The four trajectory classes identified in this model (see Figure 2-3) included: *Chronic co-occurring* (N=233; 30.1%); *Moderate co-occurring* (N=221; 28.5%); *Pure-externalizing* (N=144; 18.6%); and *Low-risk* (N=175, 22.6%). The chronic co-occurring class exhibited the highest levels of externalizing and internalizing problems. The moderate co-occurring class exhibited moderate levels of externalizing and internalizing problems. The pure-externalizing class exhibited high externalizing problems and low levels of internalizing problems. Finally, the low-risk class consisted of children with low levels of externalizing and internalizing

problems. Notably, the 4-class model did not identify a *Pure-internalizing* class (nor was this class identified in the 5- or 6-class models).

4.5.4. Associations Between the Co-Occurring Problem Behavior Groups and Their Academic Performance and Teacher-Child Relationship Trajectories

Prior to examining the associations between children's co-occurring internalizing and externalizing trajectories and their teacher-child relationship and academic performance trajectories, unconditional sequential growth models were estimated. These models were estimated separately for each scholastic domain to assess whether the sequential growth models exhibited adequate model fit. Model fit was assessed using a combination of fit indices including the comparative fit index (CFI), Tucker-Lewis index (TLI), the root-mean-square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). CFI values greater than 0.95, TLI values greater than 0.95, RMSEA scores less than 0.06, and SRMR scores less than 0.08 are indicative of adequate model fit (Bollen & Curran, 2006). Initially, these sequential models were specified including quadratic factors to account for non-linear growth, however, quadratic effects were consistently small and statistically non-significant for the teacher-child relationship models, and resulted in convergence and estimation problems in the academic performance models. Therefore, this quadratic factor was removed, and results are presented for the more parsimonious sequential linear models. The unconditional sequential linear growth models had adequate model fit.

After establishing that the (baseline) unconditional models exhibited adequate model fit, these models were specified again as conditional models by including effects for the co-occurring externalizing and internalizing trajectory classes as well as the covariate effects (i.e., gender, ethnicity, early literacy skills, intelligence, and family socioeconomic adversity). More

specifically, for the co-occurring externalizing and internalizing trajectory classes, each child's class assignment into one of the four identified classes was extracted and used to create a series of dummy coded variables reflecting the chronic co-occurring, moderate co-occurring, pure-externalizing, and the low-risk classes. Initially, the low-risk class was used as the reference group, and subsequently, the models were re-estimated using the chronic co-occurring class as the reference group in order to further investigate potential class differences in the scholastic outcomes. For each academic performance and teacher-child relationship construct, these dummy coded variables and the covariate effects were all included in one model as predictors of the latent intercept factor and two slope factors (assessing differential growth rates from grades 1 to 5 and grades 6 to 12 for teacher-child conflict and warmth, and from grades 1 to 5 and grades 6 to 9 for math and reading performance). These models were also re-specified by adjusting the intercept factor in order to examine group differences at different waves (i.e., at grades 1, 5, 6, and 12 for teacher-child conflict and warmth; and grades 1, 5, 6, and 9 for math and reading performance). Results (i.e., estimates, significance tests, and standard errors) for these models are presented in Table 4-4 (using the low-risk class as the referent) and Table 4-5 (using the chronic co-occurring class as the referent), and illustrated (for interpretative purposes) in Figure 4-1.

Table 4-3. Fit Indices of Models Examining the Developmental Trajectories of Internalizing and Externalizing Problems from Grades 1 to 12

<i>C</i>	<i>AIC</i>	<i>BIC</i>	<i>SSABIC</i>	<i>Entropy</i>	<i>BLRT</i>	<i>BLRT p value</i>
2	9211.802	9272.256	9230.974	0.882	-6266.775	<.001
3	8470.755	8563.760	8500.251	0.836	-4592.901	<.001
4	7791.659	7917.217	7831.479	0.838	-4215.377	<.001
5	7492.370	7650.480	7542.514	0.838	-3868.830	<.001
6	7200.383	7391.044	7260.850	0.848	-3728.947	<.001

Notes: The optimal model is shown in bold font. C=class; AIC=Akaike information criterion; BIC=Bayesian information criterion; SSABIC=Sample-size adjusted Bayesian information criterion; BLRT=bootstrap likelihood ratio test.

Table 4-4. Estimates for Models Examining Children’s Teacher-child Relationship Quality and Academic Performance Trajectories by Four Differentiated Co-development Trajectories of Internalizing and Externalizing Problems (Using Low-risk Class as Reference)

	Conflict			Warmth			Reading			Math		
	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE
G1 Intercept Effects												
Chronic co-occurring	1.3	***	0.07	-0.84	***	0.07	-6.27	***	1.56	-6.15	***	1.16
Moderate co-occurring	0.14	**	0.05	-0.2	***	0.05	-2.87		1.59	-3.46	**	1.11
Pure-externalizing	0.75	***	0.08	-0.47	***	0.07	-3.05		1.69	-1.85		1.3
Gender (male=1)	0.16	**	0.05	-0.12	*	0.05	-3.09	**	1.12	1.2		0.84
Kindergarten literacy skills	-0.01		0.05	0.09		0.05	9.41	***	1.16	4.17	***	0.86
Family SES adversity	0.06		0.04	-0.1	**	0.04	-1.79	*	0.83	-3.73	***	0.66
Intelligence	-0.004	*	0.03	0.04		0.03	2.23	***	0.6	3.7	***	0.46
African American	0.19	*	0.09	-0.03		0.08	-2.9		1.5	-3.99	***	1.19
Hispanic	-0.07		0.06	0.07		0.06	3.26	*	1.3	-4.74	***	1
Slope Effects (G1-G5)												
Chronic co-occurring	-0.54	*	0.25	-0.2		0.28	2.89		3.57	-1.12		2.87
Moderate co-occurring	0.03		0.16	-0.3		0.23	-0.74		3.52	2.11		2.66
Pure-externalizing	0.07		0.28	-0.31		0.28	2.98		3.83	-3.43		2.92
Gender (male=1)	0.11		0.18	0.04		0.2	2.23		2.48	-0.63		2.04
Kindergarten literacy skills	0.15		0.2	-0.18		0.21	-8.01	**	2.74	0.51		1.74
Family SES adversity	0.02		0.15	0.4	**	0.16	-1.93		1.8	2.99	*	1.49
Intelligence	0.1		0.1	-0.02		0.11	-1.15		1.38	-3	**	1.03
African American	0.29		0.31	-0.23		0.33	-5.79		3.2	2.48		2.83
Hispanic	-0.05		0.22	-0.02		0.23	-6.14	*	2.93	7.24	*	2.49
G5 Intercept Effects												
Chronic co-occurring	1.08	***	0.07	-0.92	***	0.08	-5.12	***	1.27	-6.6	***	1.1
Moderate co-occurring	0.15	***	0.04	-0.31	***	0.07	-3.17	**	1.22	-2.62	*	1.08
Pure-externalizing	0.78	***	0.08	-0.6	***	0.08	-1.86		1.22	-3.22	**	1.21
Gender (male=1)	0.2	***	0.05	-0.1		0.06	-2.2	*	0.88	0.95		0.8
Kindergarten literacy skills	0.06		0.06	0.02		0.06	6.21	***	1.16	4.37	***	0.82
Family SES adversity	0.07		0.04	0.06		0.04	-2.57	***	0.62	-2.54	***	0.59
Intelligence	0		0.03	0.03		0.03	1.77	***	0.48	2.5	***	0.42
African American	0.31	***	0.09	-0.13		0.09	-5.21	***	1.15	-3	**	1.11
Hispanic	-0.09		0.06	0.06		0.07	0.81		1	-1.84	*	0.93

Table 4-4 Continued. Estimates for Models Examining Children’s Teacher-child Relationship Quality and Academic Performance Trajectories by Four Differentiated Co-development Trajectories of Internalizing and Externalizing Problems (Using Low-risk Class as Reference)

	Conflict			Warmth			Reading			Math		
	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE
G6 Intercept Effects												
Chronic co-occurring	1.07	***	0.08	-0.96	***	0.09	-6.8	***	1.32	-8.02	***	1.03
Moderate co-occurring	0.07		0.05	-0.28	***	0.08	-5.12	***	1.22	-3.69	***	0.93
Pure-externalizing	0.71	***	0.08	-0.67	***	0.09	-3.03	*	1.3	-3.38	**	1.15
Gender (male=1)	0.22	***	0.06	-0.28	***	0.06	-3.02	***	0.88	0.11		0.74
Kindergarten literacy skills	0.03		0.06	-0.07		0.06	5.86	***	1.21	4.11	***	0.84
Family SES adversity	0.16	***	0.05	-0.2	***	0.06	-3.64	***	0.65	-2.4	***	0.6
Intelligence	-0.002		0.03	0		0.04	1.54	**	0.49	2.72	***	0.42
African American	0.22	*	0.1	-0.01		0.12	-5.76	***	1.22	-4.07	***	1.17
Hispanic	0.09		0.07	0		0.08	-2.3	*	1.03	-3.1	***	0.88
Slope Effects (G6-G9/G12)												
Chronic co-occurring	-1.4	***	0.24	1.22	***	0.27	-7.94	**	3.08	-3.89		3.22
Moderate co-occurring	0.07		0.16	0.05		0.23	-3.26		2.83	-0.06		2.99
Pure-externalizing	-0.75	**	0.24	0.67	*	0.28	-4.55		3.03	-4.89		3.27
Gender (male=1)	-0.36	*	0.16	0.34		0.19	-0.49		2.11	5.09	*	2.21
Kindergarten literacy skills	-0.02		0.17	0.24		0.17	-4.77	**	1.81	-2.55		2.16
Family SES adversity	-0.12		0.13	0.18		0.16	0.26		1.66	-1.53		1.57
Intelligence	0.01		0.09	-0.02		0.1	3.67	***	1.06	0.05		1.03
African American	-0.46		0.27	0.16		0.31	-4.89	*	2.48	-3.22		3.07
Hispanic	-0.41		0.2	0.1		0.24	-3.44		2.49	-5.31	*	2.54
G9/G12 Intercept Effects												
Chronic co-occurring	0.31	**	0.1	-0.23	*	0.12	-9.18	***	1.57	-9.19	***	1.35
Moderate co-occurring	0.1		0.07	-0.25	*	0.1	-6.1	***	1.49	-3.71	**	1.24
Pure-externalizing	0.32	***	0.1	-0.27	*	0.11	-4.39	**	1.57	-4.84	***	1.48
Gender (male=1)	0.02		0.07	-0.08		0.08	-3.17	**	1.06	1.63		0.95
Kindergarten literacy skills	-0.01		0.07	0.07		0.08	4.43	***	1.2	3.35	**	1.1
Family SES adversity	0.08		0.05	-0.09		0.06	-3.56	***	0.79	-2.86	***	0.7
Intelligence	0.001		0.03	-0.02		0.04	2.64	***	0.57	2.74	***	0.48
African American	-0.02		0.11	0.08		0.12	-7.23	***	1.37	-5.03	***	1.34
Hispanic	-0.13		0.08	0.05		0.1	-3.33	**	1.21	-4.69	***	1.08

Notes. Results are based on conditional sequential growth models, using the low-risk class as the reference group. For the G9/G12 intercept effects, intercept effects were assessed at grade 12 for teacher-child conflict and warmth, and at grade 9 for math and reading performance. **p* < .05. ***p* < .01. ****p* < .001. G = grade.

Table 4-5. Estimates for Models Examining Children’s Teacher-child Relationship Quality and Academic Performance Trajectories by Four Differentiated Co-development Trajectories of Internalizing and Externalizing Problems (Using Chronic Class as Reference)

	Conflict			Warmth			Reading			Math		
	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE
G1 Intercept Effects												
Moderate co-occurring	-1.14	***	0.07	0.63	***	0.07	2.81	^	1.48	2.36	*	1.04
Pure-externalizing	-0.53	***	0.10	0.36	***	0.08	2.69	^	1.57	4.01	***	1.21
Slope Effects (G1-G5)												
Moderate co-occurring	0.52	*	0.25	-0.06		0.28	-2.80		3.11	3.70		2.70
Pure-externalizing	0.57		0.28	-0.09		0.30	0.84		3.28	-1.89		2.84
G5 Intercept Effects												
Moderate co-occurring	-0.93	***	0.07	0.61	***	0.08	1.69		1.19	3.84	***	0.99
Pure-externalizing	-0.30	**	0.10	0.33	***	0.09	3.03	**	1.16	3.25	**	1.09
	Conflict			Warmth			Reading			Math		
	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE	Estimates	<i>p</i>	SE
G6 Intercept Effects												
Moderate co-occurring	-0.97	***	0.08	0.68	***	0.09	1.44		1.18	4.18	***	0.92
Pure-externalizing	-0.35	***	0.10	0.29	**	0.09	3.56	**	1.21	4.51	**	1.14
Slope Effects (G6-G9/G12)												
Moderate co-occurring	1.26	***	0.24	-1.16	***	0.27	4.76	^	2.73	3.82		2.79
Pure-externalizing	0.59	*	0.29	-0.54		0.29	3.46		2.75	-1.02		2.94
G9/G12 Intercept Effects												
Moderate co-occurring	-0.21	*	0.07	-0.01		0.11	2.87	*	1.37	5.33	***	1.13
Pure-externalizing	0.01		0.10	-0.04		0.11	4.60	***	1.43	4.21	***	1.32

Notes. Results are based on conditional sequential growth models, using the chronic co-occurring class as the reference group. For the G9/G12 intercept effects, intercept effects were assessed at grade 12 for teacher-child conflict and warmth, and at grade 9 for math and reading performance. These models included covariate effects which are reported in Table 4-4, and not shown here to simplify the presentation of results. Similarly, because differences between the low-risk and chronic co-occurring classes are also reported in Table 4-4, they are not reproduced in this table. **p* < .05. ***p* < .01. ****p* < .001. ^*p* < .10. G = grade.

4.5.4.1. Teacher-child Conflict

The conditional sequential growth model for teacher-child conflict had adequate fit ($\chi^2 = 141.88$, $df = 115$, $p < .001$; RMSEA = .017; CFI = 0.987; TLI = 0.982; SRMR = .037). The results indicated that, compared to the low-risk group ($M_{intercept\ G1} = 1.32$, $p < .001$; $M_{intercept\ G5} = 1.19$, $p < .001$; $M_{slope\ G1-G5} = -.34$, $p < .01$), the chronic co-occurring group had significantly higher levels of conflict in grade 1 which persisted until grade 5, albeit a significant decline in conflict from grades 1 to 5 (see Table 4-4). After the transition to middle school, compared to the low-risk group ($M_{intercept\ G6} = 1.21$, $p < .001$; $M_{intercept\ G12} = 1.29$, $p < .001$; $M_{slope\ G6-G12} = .14$, $p = ns$), the chronic co-occurring group maintained significantly higher levels of conflict in grade 6 which persisted until grade 12, notwithstanding a significant decline in conflict from grades 6 to 12. Similar results were found for children in the pure-externalizing group such that they had higher levels of conflict (compared to the low risk group) in grade 1, 5, 6 and 12, however they exhibited a significant decline in conflict from grade 6 to 12 (but not from grade 1 to 5). In contrast to these two groups, results for the moderate co-occurring group indicated significantly higher levels of conflict (compared to the low-risk group) in grades 1 and 5, however group differences in conflict were attenuated (non-significant) after the transition to middle school (grade 6 and 12). Moreover, the slope effects of the moderate co-occurring group were comparable to the low-risk group, before and after the middle school transition.

To assess whether the observed differences in teacher-child conflict trajectories were significantly different among the three risk groups, this model was re-specified using the chronic co-occurring class as the reference group. Results (i.e., intercept effects; see Table 4-5) indicated that the chronic co-occurring group had significantly higher teacher-child conflict than the moderate co-occurring group in grades 1, 5, 6, and 12. Although these differences remained

significant through grade 12, the significant slope effects indicated that these classes exhibited differential growth trajectories, such that group differences became less pronounced across time. Similar results were found when comparing the chronic co-occurring and pure externalizing classes, which were significantly different in 1, 5, and 6, however, by grade 12, these two groups exhibited comparable levels of conflict.

In addition to the effects of the trajectory groups, there were also several significant covariate effects. More specifically, at grade 1, boys, African Americans, and children with lower intelligence scores had higher rates of teacher-child conflict. The gender and race effects remained significant through grade 6, but were non-significant by grade 12. Family socioeconomic adversity was also associated with higher rates of conflict in grade 6 only. In terms of slope effects, boys were more likely to have a decline in teacher-child conflict from grades 6 to 12.

4.5.4.2. Teacher-child Warmth

The conditional sequential linear model for teacher-child warmth had adequate fit ($\chi^2 = 177.66$, $df = 115$, $p < .001$; RMSEA = .026; CFI = 0.947; TLI = 0.929; SRMR = .039). The results indicated that, compared to the low-risk group ($M_{intercept\ G1} = 4.40$, $p < .001$; $M_{intercept\ G5} = 4.33$, $p < .001$; $M_{slope\ G1-G5} = -.13$, $p = ns$), the chronic co-occurring group had significantly lower levels of warmth in grade 1 which persisted until grade 5. After the transition to middle school, compared to the low-risk group ($M_{intercept\ G6} = 4.14$, $p < .001$; $M_{intercept\ G12} = 3.62$, $p < .001$; $M_{slope\ G6-G12} = -.86$, $p < .001$), the chronic co-occurring group maintained significantly lower levels of warmth in grade 6 which persisted until grade 12. However, this group unexpectedly exhibited a significant increase in warmth from grades 6 to 12. Similar results were found for children in the pure-externalizing group such that they had lower levels of

warmth (compared to the low-risk group), in grades 1, 5, 6, and 12, notwithstanding a significant slope effect from grades 6 to 12 (but not from grades 1 to 5). Results for the moderate co-occurring group indicated significantly lower levels of warmth (compared to the low-risk group) across grades 1, 5, 6 and 12, and the slope effects were comparable to the low-risk group.

Using the chronic co-occurring group as the referent, the results indicated that this group had significantly lower levels of warmth than the moderate co-occurring and pure externalizing groups in grades 1, 5 and 6, but group differences were attenuated through secondary school, and non-significant by grade 12. The slope effects were consistent with this pattern of findings, such that the moderate co-occurring group exhibited a significant decline in warmth during the secondary school years (grades 6 to 12).

In addition to the effects of the trajectory groups, several significant covariate effects emerged. More specifically, girls had higher rates of teacher-child warmth in grades 1 and 6. Family socioeconomic adversity was negatively associated with teacher-child warmth in grades 1 and 6. However, the significant positive slope effect from grades 1 to 5 indicated that socioeconomic adversity was unexpectedly associated with a growth in teacher-child warmth during the elementary school grades.

4.5.4.3. Reading Performance

The conditional sequential linear model for reading performance (from grades 1 to 9) had adequate fit ($\chi^2 = 144.376$, $df = 76$, $p < .001$; RMSEA = .034; CFI = 0.989; TLI = 0.984; SRMR = .029). The results indicated that, compared to the low-risk group ($M_{intercept\ G1} = 99.54$, $p < .001$; $M_{intercept\ G5} = 98.20$, $p < .001$; $M_{slope\ G1-G5} = -3.36$, $p = ns$), the chronic co-occurring group had significantly lower reading performance in grade 1 which persisted until grade 5. After the transition to middle school, compared to the low-risk group ($M_{intercept\ G6} = 99.55$, $p <$

.001; $M_{intercept\ G9} = 102.51, p < .001$; $M_{slope\ G6-G9} = 9.85, p < .001$), the chronic co-occurring group maintained significantly lower reading performance in grade 6 which persisted until grade 9. Moreover, the significant negative slope effect for the chronic co-occurring group indicated that their gains in reading performance were less than those experienced by the low-risk group. Children in the pure-externalizing group demonstrated comparable reading performance compared to children in the low-risk group during the elementary school grades. However, their reading performance was significantly lower after the transition to middle school (i.e., grade 6 and grade 9). Results for the moderate co-occurring group indicated significantly lower reading performance in grades 5, 6 and 9 (but not in grade 1).

Using the chronic co-occurring group as the referent, the results indicated that this group had persistently lower levels of reading performance than the pure externalizing group in grades 1, 5, 6, and 9 (however, the grade 1 effect was significant at a marginal level, $p < .10$). The chronic co-occurring group had lower levels of reading performance than the moderate co-occurring group in grade 1 (marginally significant, $p < .10$), however, these effects were attenuated (non-significant) in grades 5 and 6. In grade 9, the chronic co-occurring group had significantly lower levels of reading performance. Consistent with this pattern of findings, the moderate co-occurring group had a marginally significant positive slope effect in grades 6 to 9.

In addition to the effects of the trajectory groups, the results indicated significant covariate effects on reading performance over time. Specifically, boys and children with lower literacy skills, lower intelligence, and higher family socioeconomic adversity had persistently lower reading performance across grades 1, 5, 6 and 9. Significant negative slope effects were found for early literacy skills before and after the middle school transition. Thus, although early literacy skills were persistently associated with higher reading scores over time, the effect of

early literacy skills became less pronounced from grades 1 to 9. From grades 6 to 9, a positive slope effect was also found for intelligence. With respect to race and ethnicity, African American children had significantly lower reading performance in grades 5, 6, and 9 (but not in grade 1), as well as a significant negative slope effect from grades 6 to 9 indicating a declining trend after the middle school transition. Hispanic children had significantly higher reading performance in grade 1, but significantly lower reading performance after the middle school transition (i.e., grades 6 and 9). These findings were consistent with the significant negative slope effect for Hispanic children from grades 1 to 5, such that they exhibited a gradual decline in reading performance over time.

4.5.4.4. Math Performance

The conditional sequential linear model for children's math performance (from grades 1 to 9) exhibited adequate fit ($\chi^2 = 158.022$, $df = 76$, $p < .001$; RMSEA = .037; CFI = 0.988; TLI = 0.981; SRMR = .024). The results indicated that, compared to the low-risk group ($M_{intercept\ G1} = 103.93$, $p < .001$; $M_{intercept\ G5} = 103.52$, $p < .001$; $M_{slope\ G1-G5} = -1.01$, $p = ns$), the chronic co-occurring group had significantly lower math performance in grade 1 which persisted through grade 5. After the transition to middle school, compared to the low-risk group ($M_{intercept\ G6} = 103.46$, $p < .001$; $M_{intercept\ G9} = 99.36$, $p < .001$; $M_{slope\ G6-G9} = -13.67$, $p < .001$), the chronic co-occurring group maintained significantly lower math performance in grade 6 which persisted until grade 9. The pure-externalizing group initially (in grade 1) had comparable levels of math performance as the low-risk group, however, from grades 5 to 9 children in this group had significantly lower math performance. Results for the moderate co-occurring group indicated persistently lower math performance from grades 1 to 9, compared to the low-risk group. All

slope effects for the three risk groups were comparable to the low-risk group before and after the middle school transition.

Using the chronic co-occurring group as the referent, the results indicated that this group had persistently lower levels of math performance than the pure externalizing and moderate co-occurring groups in grades 1, 5, 6, and 9. The slope effects indicated that the growth patterns in math performance were not significantly different among these groups.

In addition to the effects of the trajectory groups, the results indicated significant covariate effects on math performance. More specifically, over time (i.e., in grades 1, 5, 6 and 9), early literacy skills and intelligence were positively associated, and family socioeconomic adversity was significantly negatively associated, with math performance. However, the significant slope effects for family socioeconomic adversity and intelligence (from grades 1 to 5) indicated that these effects were somewhat attenuated through the elementary school grades. With respect to race and ethnicity, African American and Hispanic children had significantly lower math performance over time (in grades 1, 5, 6 and 9) compared to their Caucasian peers. Moreover, a significant positive slope effect was found for Hispanic children from grades 1 to 5, such that they exhibited gains in math performance in elementary school. However, from grades 6 to 9, Hispanic children had a significant decline (negative slope) in their math performance. Across time, gender differences in math performance were small and not statistically significant, however, boys exhibited an increasing trend after the middle school transition.

Although there were statistically significant differences in reading and math performance among the four trajectory classes, it appeared that the estimated trajectories (see Figure 2-3) for each trajectory class were in the ‘average’ range (i.e., scores ranging from 90-110, according to the Woodcock-Johnson manual). Thus, to further ascertain the degree of academic risk in each

trajectory class, post-hoc analyses were performed to estimate the percentage of children in each class that fell in one of the ‘below average’ performance categories (i.e., low-average, low and very low; reflecting the bottom 24th percentile of children in normative samples). With respect to reading performance, the results indicated (see Table S6) that about 41% to 49% of children in the chronic co-occurring group, 20% to 38% of the pure-externalizing group, 23% to 34% of the moderate co-occurring group, and 12% to 20% of the low-risk group were below average. Moreover, across grade levels, children in the chronic co-occurring group were about 2 to 4 times more likely than children in the low-risk group to be below average in their reading performance. The chronic co-occurring group also exhibited the lowest rates of math performance, such that 24% to 54% of children in this group were below average across time (compared to 3% to 17% of the low-risk group).

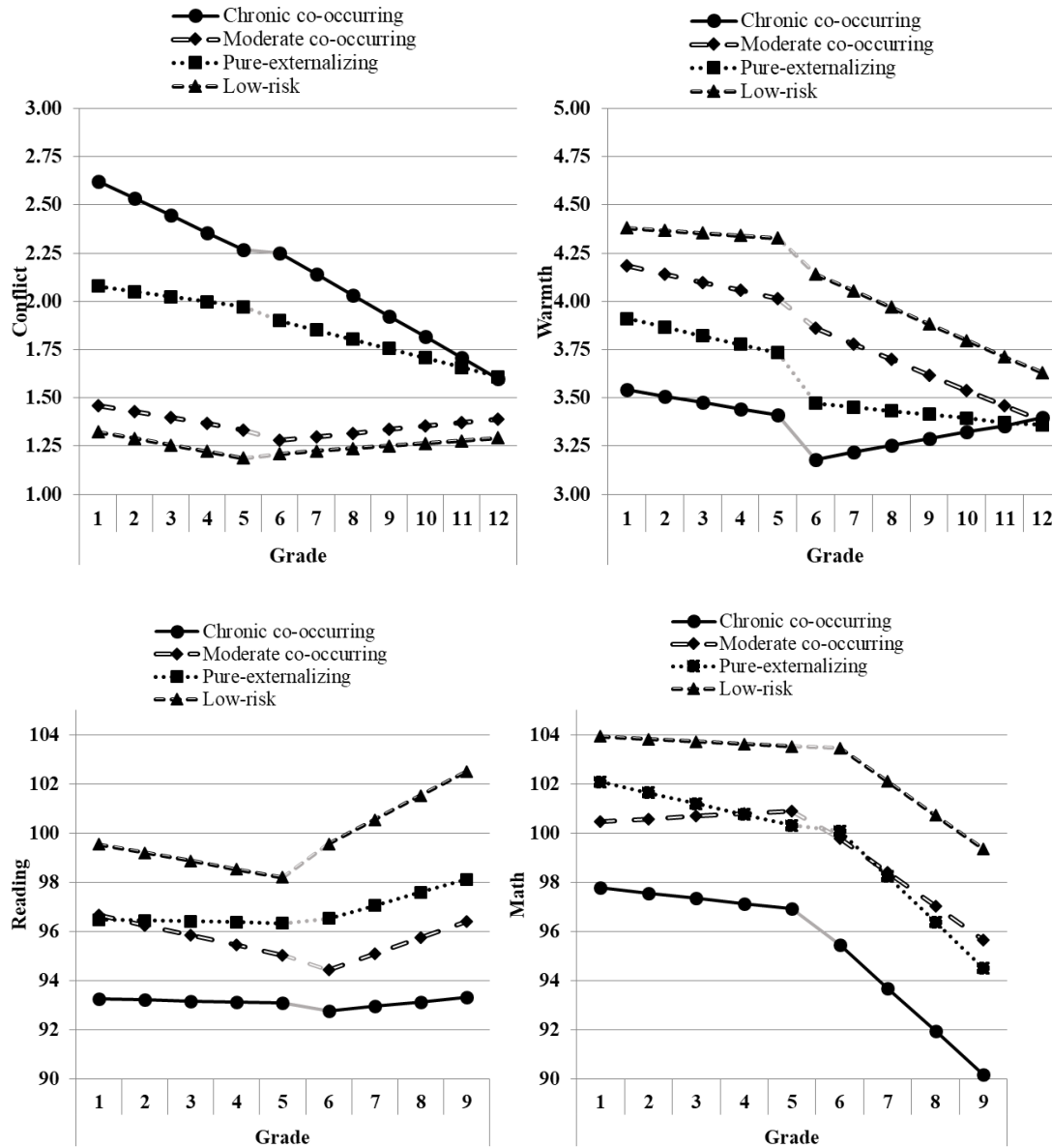


Figure 4-1. Children’s Predicted Trajectories for Teacher-child Warmth and Conflict, Reading Performance, and Math Performance for Each of the Four Co-development Trajectories of Internalizing and Externalizing Problems.

4.6. Discussion

The results of this study make four novel contributions to what is known about co-occurring trajectories of internalizing and externalizing problems in educational settings, and their associations with children's scholastic outcomes. First, by using a person-centered approach, this study provides insights into the co-occurring development of internalizing and externalizing trajectories across the entire period of formal schooling (i.e., grades 1 to 12), a substantially longer period than has been investigated to date. Second, the findings identified four distinct subtypes of co-occurring trajectories including chronic co-occurring, moderate co-occurring, pure-externalizing, and low-risk classes, and provided insights pertaining to their long-term associations with multiple school adjustment indicators (i.e., teacher-child conflict and warmth, and math and reading performance). Third, my findings corroborated a child/symptom-driven perspective. That is, compared to children in the low-risk class, those who were classified into the three higher-risk classes experienced lower relationship quality with teachers (i.e., higher conflict and lower warmth), and performed more poorly in reading and math, even after controlling for the effects of gender, ethnicity, family socioeconomic adversity, intelligence and kindergarten literacy skills. Moreover, the chronic co-occurring class exhibited the greatest deficits in their scholastic outcomes compared to the other two risk classes. Fourth, our research design allowed us to explicitly investigate potential developmental variations in childhood and adolescence, and more specifically, examine the potential impact of the middle school transition on continuities and discontinuities in teacher-child relationship quality and academic performance for each of the identified trajectory classes.

4.6.1. Teacher-child Relationship Quality

After identifying children's externalizing and internalizing trajectory classes, we investigated how their co-occurring trajectories were associated with the development of teacher-child relationship quality from grades 1 to 12. Comparisons across the three identified risk groups and the low-risk group indicated significant group differences for both of the dimensions assessed (i.e., warmth and conflict). Moreover, my findings corroborated the hypothesis that children with chronic co-occurring problems experienced persistently lower teacher-child relationship quality among the four subgroups, and in comparison to children with moderate co-occurring and pure externalizing problems.

With respect to teacher-child conflict, the findings indicated that each of the identified risk groups experienced more elevated levels of conflict compared to the low-risk group, however, there appeared to be some developmental variations in the pattern (trajectory) and severity of conflict over time. Children in the chronic co-occurring group exhibited the highest rates of conflict at the outset (grade 1). Although children in this group maintained persistently higher levels of conflict throughout their schooling careers compared to the low-risk and moderate co-occurring groups, their rates of conflict were comparable to the pure-externalizing class by grade 12. There are several possible explanations for these findings. Consistent with child and symptom-driven models (Mejia & Hoglund, 2016), which aim to investigate the deleterious long-term effects of children's individual dispositions or behavioral styles, it is plausible that children in the chronic co-occurring and pure-externalizing classes were the most likely to exhibit a confrontational interactional style that persisted as they matured, and resulted in more teacher-child conflict. Moreover, children with chronic co-occurring and pure-externalizing problems may also have greater deficits in self- and emotion-regulation which may

have reduced their capacity to prevent and resolve conflicts with teachers (Granic, 2001; Woltering & Shi, 2016).

Although children's individual dispositions and behavioral styles may precipitate conflictual interactions with teachers, it is also important to consider the dyadic nature of teacher-child relationships, and potential teacher-driven or bidirectional associations between conflict and problem behaviors. That is, to the extent teachers respond in ineffectual ways to children's problem behaviors (e.g., reacting with overt hostility or inadvertently escalating the conflict), their reactions may exacerbate or reinforce children's problem behaviors, contributing to the long-term associations reported in this study. Moreover, although children typically have new teachers each school year, it is plausible that teachers within the same school communicate about their students, and in particular, about children they perceive as being difficult to manage or interact with. These preconceived perceptions may contribute to having more conflictual relationships with certain students, over and above the effects of children's behavioral styles. There is also some evidence that teacher bias may further impact relationship quality. That is, teachers' beliefs about children's age, race, ethnicity, gender or socioeconomic backgrounds may influence how they interact with students (McGrath & Bergen, 2015). Extant studies have reported more conflictual relationships with minority students compared to non-minority peers (Ladd, Birch, & Buhs, 1999; Wyrick & Rudasill, 2009), and when teachers and students have different ethnic or racial backgrounds (Saft & Pianta, 2001). In the current study, because most teachers were Caucasian, it was not possible to consider the effects of teacher-child ethnic similarities or differences. However, we examined children's demographic characteristics as potential sources of variation in their relationship quality, and examined the effects of their

problem behaviors over and above the effects of these other explanatory factors, thus reducing concerns about potential confounding variables.

Contrary to expectations, children in the chronic co-occurring and externalizing groups exhibited steeper declines in conflict compared to the low-risk group. Thus, it appeared that their rates of teacher-child conflict became less pronounced over time, however, they were still at greater risk for conflict by grade 12. These findings are consistent with, and extend, results by other investigators who have reported a normative decline in conflict (Wu & Hughes, 2015). Stated differently, the normative decline in conflict may be primarily driven by children with problem behaviors who initially have higher rates of conflict. Perhaps the changing classroom structure after the transition to middle school (e.g., spending time with multiple teachers, larger class sizes, fewer one-on-one interactions with teachers) provides fewer opportunities for teacher-child conflict, even for children with chronic co-occurring or pure externalizing problems. In contrast, children with low levels of problem behaviors (i.e., the low-risk class) exhibited stable low levels of conflict throughout their schooling careers, which were not significantly impacted by the middle school transition.

In addition to the findings for the chronic co-occurring and pure externalizing classes, the moderate co-occurring class also demonstrated higher rates of conflict (compared to the low-risk group) during the elementary grades, however, these effects were attenuated in secondary school (grades 6 to 12). Although children in this class continued to exhibit modest rates of problem behaviors throughout childhood and adolescence, it is possible that over time, they were better able to manage and regulate their emotional and behavioral difficulties compared to children in the other risk groups, which perhaps provided some buffer for experiencing sustained conflict with teachers.

Findings pertaining to teacher-child warmth indicated that each of the identified risk groups experienced lower rates of teacher-child warmth compared to the low-risk group, however, there appeared to be some developmental variations over time. Throughout elementary school, children in the chronic co-occurring class exhibited the lowest levels of warmth, followed by the pure-externalizing class, and subsequently the moderate co-occurring class. Taken together, several conclusions can be drawn from these findings. Expanding on studies that have examined externalizing and internalizing problems as distinct forms of problem behaviors, the results suggest that the combination of externalizing *and* internalizing problems may have more pronounced effects on compromising the development of teacher-child warmth, particularly during the elementary school years. Investigators have proposed that there are two behavioral styles or orientations that may primarily impact teacher-child warmth, when children engage in hostile or confrontational ways which disrupt the classroom climate, and when children appear withdrawn from, or disinterested in, classroom activities (for a discussion of ‘moving against’ and ‘moving away’ behavioral orientations, see Birch & Ladd, 1998). Although these behavioral styles have typically been conceptualized as being independent and characteristic of different children, it is plausible that children in the chronic co-occurring group are particularly susceptible to low teacher-child warmth because they displayed both of these behavioral risks.

Notably, the results showed that all of the groups exhibited a decline in warmth across the elementary school years, and many children also exhibited a further drop in warmth after the transition to middle school. These findings are consistent with prior research on normative trends in teacher-child warmth, such that, on average, rates of teacher child-warmth decline over time. (Jerome et al., 2009; Lee & Bierman, 2018; Wu & Hughes, 2015). Moreover, these findings

support the premise that the middle school transition is a particularly challenging period for many children, and may compromise their ability to initiate and form warm relationships with teachers, regardless of whether they exhibit problem behaviors (Anderman, 2003; Barber & Olsen, 2004; Roeser, Eccles, & Sameroff, 1998). Contrary to expectations, children in the chronic co-occurring group exhibited a slight increase in warmth during the secondary school years. Nonetheless, by grade 12, their rates of warmth were still below the low-risk group. Although the explanation for this finding is unclear, it is possible that the changing classroom structure and new school context provided by the transition to middle school allowed some of these children to experience modest improvements in their teacher-child warmth.

4.6.2. Academic Performance

Several general conclusions can be drawn pertaining to the findings for reading and math performance. Although all three risk groups exhibited lower rates of reading and math performance over time, compared to the low-risk class, the lowest levels of reading and math performance were linked with the chronic co-occurring group. More specifically, children in the chronic co-occurring class exhibited significantly lower rates of reading and math performance in grade 1, and these differences persisted over time (i.e., in grades 5, 6, and 9). Notably, these differences emerged even after controlling for gender, race and ethnicity, family socioeconomic adversity, and early literacy skills and intelligence.

Taken together, these findings provide support for the adjustment erosion hypothesis according to which internalizing and externalizing problems contribute to lower academic performance (Moilanen et al., 2010; Vaillancourt et al., 2013; Verboom et al., 2014; Zimmermann et al., 2013). Prior studies that have investigated and corroborated the adjustment erosion hypothesis have typically used variable-centered designs in order to examine the additive

effects of internalizing and externalizing problems on academic performance (e.g., Moilanen et al., 2010; Vaillancourt et al., 2013). Building on these findings, the current study's use of a person-centered design allowed us to more explicitly identify and examine patterns of continuity and changes in the academic performance of children with chronic co-occurring trajectories, and to differentiate their performance from children with pure externalizing trajectories. Using this approach, the findings lent support to the premise that children with co-occurring problems, who face a combination of risk processes associated with both domains of problem behaviors, are more likely to have persistently lower reading and math performance. However, it is important to note that the statistical approach and correlational design used in this study limited the ability to make causal inferences pertaining to the direction of effect between children's problem behaviors and academic performance. Indeed, consistent with extant research (Englund & Siebenbruner, 2012; Metsäpelto et al., 2020; van Lier et al., 2012; Verboom et al., 2014; Zimmermann et al., 2013), it is plausible that there are likely bidirectional or reciprocal associations between these constructs.

As noted, children in the pure-externalizing and moderate co-occurring classes also exhibited lower rates of academic performance compared to the low-risk class, however, these group differences were smaller in magnitude and became more pronounced in the late elementary school and secondary school years (i.e., grades 5, 6 and 9). These developmental differences corroborate findings from previous studies which have reported that the math performance of adolescents with greater emotion and behavior problems appear to worsen over time, especially after the middle school transition (Nelson et al., 2004).

4.6.3. Limitations and Future Directions

The findings of this study should be considered in light of several noteworthy limitations. Perhaps the major limitation of the current study was that externalizing and internalizing problems, and teacher-child relationship quality were measured exclusively by teacher reports. Indeed, it is possible that teachers' perceptions of their relationship quality are influenced by their perceptions of children's adjustment problems, introducing concerns about shared method variance. However, because the data were collected from different teachers each year, the longitudinal associations among these constructs were based on the perceptions of multiple teachers across many years of formal schooling, thus reducing the possible influence of shared method variance. That is, teacher-child relationship quality in one year was significantly correlated, in expected directions, with children's problem behaviors in subsequent years, thus providing some validation that children's problem behaviors and relationship quality were exhibiting some consistency across multiple informants. Moreover, the distinct and significant differences between the pure-externalizing and chronic co-occurring classes suggest that the findings are likely not attributable to reporter bias. That is, had the findings been attributable to a pattern in which teachers generally believed that they had lower quality relationships with students who had problem behaviors, the results may have indicated non-significant differences among the three risk groups. Finally, part of the rationale for including standardized assessments to measure reading and math performance was to provide an additional source of data on children's scholastic outcomes, independent of teacher-reports, and to further assess the robustness of differences found among the different trajectory classes. Nonetheless, one important direction for future research would be the inclusion of multiple-informant data including child self-reports to assess children's problem behaviors (particularly internalizing

problems which teachers may be less attuned at observing in larger classes), as well as assessing multiple sources of teacher-child relationship quality (e.g., child self-reports, observational assessments, and multiple teachers after students have transitioned to secondary school).

Previous studies have documented that teacher- and child-reports of relationship quality are not highly convergent, thus insights may be gleaned from examining children's perceptions, in addition to teacher reports. Building on the findings of the current study, another direction for future research may be to examine how different forms of externalizing problems (i.e., conduct problem and hyperactivity-inattention) are longitudinally associated with distinct aspects of teacher-child relationship quality and academic performance in childhood and adolescence, and considering the effects of the middle school transition. Although conduct problems and hyperactivity-inattention tend to be moderately to highly correlated and reflect the broader spectrum of externalizing problems, previous studies have documented theoretical, empirical, and clinical distinctions among these constructs (Hinshaw, 1987).

A second limitation of the current study pertains to the overall generalizability of the findings. More specifically, the generalizability may have been impacted by both the sampling procedures and participant attrition. With respect to attrition, it is possible that the increasing rates of missing data and attrition could have impacted the generalizability of my findings. However, extensive missing data analyses did not identify substantial differences among children who dropped out of the study and those who continued their participation. With respect to the sampling procedures, it is important to recognize that this study used an at-risk sample, experiencing multiple forms of early vulnerabilities (i.e., family socioeconomic adversity and being academically at-risk). However, much of the research in this area has focused on more normative samples. Thus, my sample may also be viewed as a strength for replicating and

expanding existing findings which have typically been based on more normative samples. Nonetheless, an important direction for future research would be to replicate the findings reported in the current study using larger, more representative samples.

4.6.4. Implications for Interventions

The findings from the current study have several implications for intervention efforts aimed at improving children's behavior problems and scholastic outcomes. First, in light of the findings indicating early-onset chronic co-occurring problems and concurrent associations with children's scholastic outcomes, these findings support the critical need for early screening and identification of internalizing and externalizing problems. Second, the findings imply a need for sustained intervention efforts in primary and secondary schools in order to reduce children's early internalizing and externalizing problems and their long-term associations with children's scholastic outcomes. Consistent with this viewpoint, researchers have advocated for promoting social and emotional skills and competencies (CASEL, 2013) as a means of improving scholastic outcomes and preventing the development of problem behaviors (Durlak et al., 2011). Moreover, these efforts may be particularly beneficial for children facing multiple forms of early risk and vulnerability. In addition to implementing SEL training for students, it is equally critical to provide teachers with sufficient and ongoing training on how to build positive relationships with students. Effective teacher training programs typically focus on multiple strategies teachers can use to foster closer relationships with students from diverse backgrounds such as expressing interest in students' lives outside of the classroom context, increasing the time teachers spend individually (one-on-one) with students, increasing the amount that teachers praise and reinforce positive and desirable classroom behaviors, and creating a caring, warm, safe, and trusting classroom climate (Allen, Pianta, Gregory, Mikami, & Lun, 2011; CASEL, 2003). In addition to

these strategies, it is also important for training programs to provide strategies to deal with challenging adolescents and mental health consultations for teachers. Finally, intervention efforts may need to focus more specifically on the potential impact of the middle school transition, and how it is a period in which children experience additional stressors that may negatively impact their school adjustment (Dishion & Kavanagh, 2003).

4.7. Conclusion

This study investigated the long-term associations among children's co-occurring internalizing and externalizing problems on the growth and continuity in their teacher-child relationship quality and academic performance from childhood through adolescence. Consistent with child or symptom-driven models, children with more severe and persistent co-occurring internalizing and externalizing problems were at greater risk for sustained teacher-child conflict, lower teacher-child warmth, and lower math and reading performance. Children with pure externalizing and moderate co-occurring problems were also at risk for scholastic difficulties, but to a lesser magnitude than children with chronic co-occurring problems. For children in all three risk groups, there were lasting and negative effects across the entire formal schooling years, and patterns of maladjustment were either sustained or worsened after the transition to middle school.

4.8. References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4–18 and 1991 profile*.

Burlington: University of Vermont, Department of Psychiatry.

Achenbach, T. M., & Edelbrock, C. S. (1978). The classification of child psychopathology: a review and analysis of empirical efforts. *Psychological Bulletin*, *85*, 1275–1301. doi: 10.1037/0033-2909.85.6.1275

- Achenbach, T. M., Howell, C. T., Quay, H. C., & Conners, C. K. (1991). National survey of problems and competencies among four- to sixteen-year-olds. *Monographs of the Society for Research in Child Development, 56*, 1–94. doi:10.2307/1166156
- Achenbach, T. M., Ivanova, M. Y., Rescorla, L. A., Turner, L. V., & Althoff, R. R. (2016). Internalizing/externalizing problems: Review and recommendations for clinical and research applications. *Journal of the American Academy of Child & Adolescent Psychiatry, 55*, 647–656. doi:10.1016/j.jaac.2016.05.012
- Allen, J. P., Pianta, R. C., Gregory, A., Mikami, A. Y., & Lun, J. (2011). An interaction-based approach to enhancing secondary school instruction and student achievement. *Science, 333*, 1034–1037. doi: 10.1126/science.1207998
- Anderman, L. H. (2003). Academic and social perceptions as predictors of change in middle school students' sense of school belonging. *The Journal of Experimental Education, 72*, 5–22. doi:10.1080/00220970309600877
- Angold, A., & Costello, E. J. (1993). Depressive comorbidity in children and adolescents. *American Journal of Psychiatry, 150*, 1779–1791. doi: 10.1176/ajp.150.12.1779
- Barber, B. K., & Olsen, J. A. (2004). Assessing the transitions to middle and high school. *Journal of Adolescent Research, 19*, 3–30. doi:10.1177/0743558403258113
- Birch, S. H., & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher–child relationship. *Developmental Psychology, 34*, 934–946. doi: 10.1037/0012-1649.34.5.934
- Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: A structural equation perspective* (Vol. 467). John Wiley & Sons. doi:10.1002/0471746096

- Bongers, I. L., Koot, H. M., Van der Ende, J., & Verhulst, F. C. (2003). The normative development of child and adolescent problem behavior. *Journal of Abnormal Psychology, 112*, 179–192. doi:10.1037/0021-843X.112.2.179
- Bracken, B. A., & McCallum, R. S. (1998). *Universal nonverbal intelligence test*. Chicago: Riverside Publishing Company. doi:10.1037/t06853-000
- Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, B., Dodge, K. A., ... & Lynam, D. R. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: a six-site, cross-national study. *Developmental Psychology, 39*, 222–245. doi:10.1037/0012-1649.39.2.222
- 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*, 557–567. doi: 10.1017/S0954579410000271
- Capaldi, D. M. (1992). Co-occurrence of conduct problems and depressive symptoms in early adolescent boys: II. A 2-year follow-up at Grade 8. *Development and Psychopathology, 4*, 125–144. doi: 10.1017/S0954579400005605
- Caspi, A., & Moffitt, T. E. (2018). All for one and one for all: Mental disorders in one dimension. *American Journal of Psychiatry, 175*, 831–844. doi: 10.1176/appi.ajp.2018.17121383
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 464–504. doi: 10.1080/10705510701301834

- Chen, R., & Simons–Morton, B. (2009). Concurrent changes in conduct problems and depressive symptoms in early adolescents: A developmental person–centered approach. *Development and Psychopathology, 21*, 285–307. doi:10.1017/S0954579409000169
- 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*, 583–592. doi: 10.1017/S0954579410000295
- Chen, X., Rubin, K. H., & Li, D. (1997). Relation between academic achievement and social adjustment: Evidence from Chinese children. *Developmental Psychology, 33*, 518–525. doi:10.1017/S0954579409000169
- Colder, C. R., Mott, J. A., & Berman, A. S. (2002). The interactive effects of infant activity level and fear on growth trajectories of early childhood behavior problems. *Development and Psychopathology, 14*, 1–23. doi:10.1017/S0954579402001013
- Collaborative for Academic, Social, and Emotional learning (CASEL). (2012). *2013 CASEL guide: Effective social and emotional learning programs—Preschool and elementary school edition*. Chicago: Author.
- Collaborative for Academic, Social, and Emotional learning (CASEL). (2003). *Safe and sound: An educational leader’s guide to evidence-based social and emotional learning (SEL) programs*. Chicago. Author.
- Cosgrove, V. E., Rhee, S. H., Gelhorn, H. L., Boeldt, D., Corley, R. C., Ehringer, M. A., ... & Hewitt, J. K. (2011). Structure and etiology of co–occurring internalizing and externalizing disorders in adolescents. *Journal of Abnormal Child Psychology, 39*, 109–123. doi:10.1007/s10802-010-9444-8

- Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry*, *60*, 837–844. doi:10.1001/archpsyc.60.8.837
- Côté, S. M., Boivin, M., Liu, X., Nagin, D. S., Zoccolillo, M., & Tremblay, R. E. (2009). Depression and anxiety symptoms: Onset, developmental course and risk factors during early childhood. *Journal of Child Psychology and Psychiatry*, *50*, 1201–1208. doi:10.1111/j.1469-7610.2009.02099.x
- Dahl, R. E. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. *Annals of the New York Academy of Sciences*, *1021*, 1–22. doi: 10.1196/annals.1308.001
- Davis, S., Votruba-Drzal, E., & Silk, J. S. (2015). Trajectories of internalizing symptoms from early childhood to adolescence: Associations with temperament and parenting. *Social Development*, *24*, 501–520. doi:10.1111/sode.12105
- 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*, 100–107. doi: 10.1016/j.jcrimjus.2012.12.002
- Deighton, J., Humphrey, N., Belsky, J., Boehnke, J., Vostanis, P., & Patalay, P. (2018). Longitudinal pathways between mental health difficulties and academic performance during middle childhood and early adolescence. *British Journal of Developmental Psychology*, *36*, 110–126. doi:10.1111/bjdp.12218
- Dekker, M. C., Ferdinand, R. F., van Lang, N. D., Bongers, I. L., van der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood to

- late adolescence: Gender differences and adult outcome. *Journal of Child Psychology and Psychiatry*, 48, 657–666. doi:10.1111/j.1469-7610.2007.01742.x
- Deutz, M., Shi, Q., Vossen, H., Huijding, J., Prinzie, P., Dekovic, M., Van Baar, A., & Woltering, S. (2018). Evaluation of the Strengths and Difficulties Questionnaire–Dysregulation Profile (SDQ–DP). *Psychological Assessment*, 30, 1174–1185. doi:10.1037/pas0000564
- Dishion, T. J., & Kavanagh, K. (2003). *Intervening in adolescent problem behavior: A family-centered approach*. New York: Guilford Press.
- Doumen, S., Verschueren, K., Buyse, E., Germeijs, V., Luyckx, K., & Soenens, B. (2008). Reciprocal relations between teacher–child conflict and aggressive behavior in kindergarten: A three-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, 37, 588–599. doi: 10.1080/15374410802148079
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students’ social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development*, 82, 405–432. doi:10.1111/j.1467-8624.2010.01564.x
- Eccles, J. S., & Roeser, R. (1999). School and community influences on human development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (4th ed.). Mahwah, NJ: Lawrence Erlbaum.
- Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., & Mac Iver, D. (1993). Development during adolescence: The impact of stageenvironment fit on young adolescents' experiences in schools and in families. *American Psychologist*, 48, 90–101. doi:10.1037/0003-066X.48.2.90. doi: 10.1037/0003-066X.48.2.90

- Enders, C. K. (2010). *Applied missing data analysis*. Guilford press.
- Englund, M. M., & Siebenbruner, J. (2012). Developmental pathways linking externalizing symptoms, internalizing symptoms, and academic competence to adolescent substance use. *Journal of Adolescence*, *35*, 1123–1140. doi: 10.1016/j.adolescence.2012.03.004
- Esch, P., Bocquet, V., Pull, C., Couffignal, S., Lehnert, T., Graas, M., ... & Anseau, M. (2014). The downward spiral of mental disorders and educational attainment: a systematic review on early school leaving. *BMC Psychiatry*, *14*(1), e1-e13. doi: 10.1186/s12888-014-0237-4
- Ettekal, I., & Ladd, G. W. (2017). Developmental continuity and change in physical, verbal, and relational aggression and peer victimization from childhood to adolescence. *Developmental Psychology*, *53*, 1709–1721. doi: 10.1037/dev0000357
- Ettekal, I., & Ladd, G. W. (2020). Development of aggressive-victims from childhood through adolescence: Associations with emotion dysregulation, withdrawn behaviors, moral disengagement, peer rejection, and friendships. *Development and Psychopathology*, *32*, 271–291. doi: 10.1017/S0954579419000063
- Fanti, K. A., & Henrich, C. C. (2010). Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: findings from the National Institute of Child Health and Human Development Study of Early Child Care. *Developmental Psychology*, *46*, 1159–1175. doi:10.1037/a0020659
- Formoso, D., Gonzales, N. A., & Aiken, L. S. (2000). Family conflict and children's internalizing and externalizing behavior: Protective factors. *American Journal of Community Psychology*, *28*, 175–199. doi:10.1023/A:1005135217449

- Furman, W., & Buhrmester, D. (2009). Methods and measures: The network of relationships inventory: Behavioral systems version. *International Journal of Behavioral Development, 33*, 470–478. doi:10.1177/0165025409342634
- Gazelle, H., & Ladd, G. W. (2003). Anxious solitude and peer exclusion: A diathesis–stress model of internalizing trajectories in childhood. *Child Development, 74*, 257–278. doi:10.1111/1467-8624.00534
- Gest, S. D., Welsh, J. A., & Domitrovich, C. E. (2005). Behavioral predictors of changes in social relatedness and liking school in elementary school. *Journal of School Psychology, 43*, 281–301. doi:10.1016/j.jsp.2005.06.002
- Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology, 16*, 313–333. doi:10.1017/S0954579404044530
- Goodman, A., Lamping, D. L., & Ploubidis, G. B. (2010). When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): data from British parents, teachers and children. *Journal of Abnormal Child Psychology, 38*, 1179–1191. doi: 10.1007/s10802-010-9434-x
- Goodman, R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 1337–1345. doi:10.1097/00004583-200111000-00015
- Goodman, R., & Scott, S. (1999). Comparing the Strengths and Difficulties Questionnaire and the Child Behavior Checklist: is small beautiful?. *Journal of Abnormal Child Psychology, 27*, 17–24. doi: 10.1023/A:1022658222914

- Granic, I. (2014). The role of anxiety in the development, maintenance, and treatment of childhood aggression. *Development and Psychopathology*, *26*, 1515–1530. doi: 10.1017/S0954579414001175
- Grover, R. L., Ginsburg, G. S., & Ialongo, N. (2007). Psychosocial outcomes of anxious first graders: A seven-year follow-up. *Depression and Anxiety*, *24*, 410–420. doi: 10.1002/da.20241
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher–child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development*, *72*, 625–638. doi: 10.1111/1467-8624.00301
- Hill, C. R., & Hughes, J. N. (2007). An examination of the convergent and discriminant validity of the Strengths and Difficulties Questionnaire. *School Psychology Quarterly*, *22*, 380–406. doi:10.1037/1045-3830.22.3.380
- Hinnant, J. B., & El–Sheikh, M. (2013). Codevelopment of externalizing and internalizing symptoms in middle to late childhood: Sex, baseline respiratory sinus arrhythmia, and respiratory sinus arrhythmia reactivity as predictors. *Development and Psychopathology*, *25*, 419–436. doi:10.1017/S0954579412001150
- Hinshaw, S. P. (1987). On the distinction between attentional deficits/hyperactivity and conduct problems/aggression in child psychopathology. *Psychological Bulletin*, *101*(3), 443–463. doi: 10.1037/0033-2909.101.3.443
- Hughes, J. N., & Cao, Q. (2018). Trajectories of teacher-student warmth and conflict at the transition to middle school: Effects on academic engagement and achievement. *Journal of School Psychology*, *67*, 148–162. doi:10.1016/j.jsp.2017.10.003

- Hughes, J. N., Luo, W., Kwok, O. M., & Loyd, L. K. (2008). Teacher-student support, effortful engagement, and achievement: A 3-year longitudinal study. *Journal of Educational Psychology, 100*, 1–14. doi: 10.1037/0022-0663.100.1.1
- Hymel, S., Rubin, K. H., Rowden, L., & LeMare, L. (1990). Children's peer relationships: longitudinal prediction of internalizing and externalizing problems from middle to late childhood. *Child Development, 61*, 2004–2021. doi: 10.1111/j.1467-8624.1990.tb03582.x
- Jerome, E. M., Hamre, B. K., & Pianta, R. C. (2009). Teacher–child relationships from kindergarten to sixth grade: Early childhood predictors of teacher-perceived conflict and closeness. *Social Development, 18*, 915–945. doi:10.1111/j.1467-9507.2008.00508.x
- Keiley, M. K., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2000). A cross-domain growth analysis: Externalizing and internalizing behaviors during 8 years of childhood. *Journal of Abnormal Child Psychology, 28*, 161–179. doi:10.1023/A:1005122814723
- Keiley, M. K., Lofthouse, N., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2003). Differential risks of covarying and pure components in mother and teacher reports of externalizing and internalizing behavior across ages 5 to 14. *Journal of Abnormal Child Psychology, 31*, 267–283. doi:10.1023/A:1023277413027
- Klein, A. M., Schlesier-Michel, A., Otto, Y., White, L. O., Andreas, A., Sierau, S., ... & von Klitzing, K. (2019). Latent trajectories of internalizing symptoms from preschool to school age: A multi-informant study in a high-risk sample. *Development and Psychopathology, 31*, 657–681. doi:10.1017/S0954579418000214
- Koomen, H. M., Verschueren, K., van Schooten, E., Jak, S., & Pianta, R. C. (2012). Validating the Student-Teacher Relationship Scale: Testing factor structure and measurement

- invariance across child gender and age in a Dutch sample. *Journal of School Psychology, 50*, 215–234. doi: 10.1016/j.jsp.2011.09.001
- Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... & Eaton, N. R. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology, 126*, 454–477. doi:10.1037/abn0000258
- Kremer, K. P., Flower, A., Huang, J., & Vaughn, M. G. (2016). Behavior problems and children's academic achievement: A test of growth-curve models with gender and racial differences. *Children and Youth Services Review, 67*, 95-104. doi: 10.1016/j.chilyouth.2016.06.003
- Krueger, R. F., & Markon, K. E. (2006). Reinterpreting comorbidity: A model-based approach to understanding and classifying psychopathology. *Annual Review of Clinical Psychology, 2*, 111–133. doi:10.1146/annurev.clinpsy.2.022305.095213
- Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence?. *Child Development, 70*, 1373–1400. doi: 10.1111/1467-8624.00101
- Lee, E. J., & Bukowski, W. M. (2012). Co-development of internalizing and externalizing problem behaviors: Causal direction and common vulnerability. *Journal of Adolescence, 35*, 713–729. doi:10.1016/j.adolescence.2011.10.008
- Lee, J. (2013). A cross-lagged longitudinal study of relations between academic achievement and Korean adolescent delinquency. *Health Education Journal, 72*, 555–563. doi: 10.1177/0017896912452070

- Lee, P., & Bierman, K. L. (2018). Longitudinal trends and year-to-year fluctuations in student–teacher conflict and closeness: Associations with aggressive behavior problems. *Journal of School Psychology, 70*, 1–15. doi: 10.1016/j.jsp.2018.06.002
- Lilienfeld, S. O. (2003). Comorbidity between and within childhood externalizing and internalizing disorders: Reflections and directions. *Journal of Abnormal Child Psychology, 31*, 285–291. doi:10.1023/A:1023229529866
- Ly, J., & Zhou, Q. (2018). Bidirectional associations between teacher–child relationship quality and Chinese American immigrant children’s behavior problems. *Journal of Clinical Child & Adolescent Psychology, 47*, 954–966. doi: 10.1080/15374416.2016.1183496
- Masten, A. S., & Cicchetti, D. (2010). Developmental cascades. *Development and Psychopathology, 22*, 491–495. doi: 10.1017/S0954579410000222
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., ... & Tellegen, A. (2005). Developmental cascades: linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*, 733–746. doi: 10.1037/0012-1649.41.5.733
- Maughan, B., Rowe, R., Loeber, R., & Stouthamer-Loeber, M. (2003). Reading problems and depressed mood. *Journal of Abnormal Child Psychology, 31*, 219–229. doi: 10.1023/A:1022534527021
- McGrath, K. F., & Van Bergen, P. (2015). Who, when, why and to what end? Students at risk of negative student–teacher relationships and their outcomes. *Educational Research Review, 14*, 1–17. doi: 10.1016/j.edurev.2014.12.001
- Measelle, J. R., Stice, E., & Hogansen, J. M. (2006). Developmental trajectories of co-occurring depressive, eating, antisocial, and substance abuse problems in female

- adolescents. *Journal of Abnormal Psychology*, *115*, 524–538. doi:10.1037/0021-843X.115.3.524
- Mejia, T. M., & Hoglund, W. L. (2016). Do children's adjustment problems contribute to teacher–child relationship quality? Support for a child-driven model. *Early Childhood Research Quarterly*, *34*, 13–26. doi:10.1016/j.ecresq.2015.08.003
- 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*, 246–257. doi: 10.1037/a0037389
- Metsäpelto, R. L., Zimmermann, F., Pakarinen, E., Poikkeus, A. M., & Lerkkanen, M. K. (2020). School grades as predictors of self-esteem and changes in internalizing problems: A longitudinal study from fourth through seventh grade. *Learning and Individual Differences*, *77*, 101807.
- 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*, 635–653. doi: 10.1017/S0954579410000337
- Murray, C., & Murray, K. M. (2004). Child level correlates of teacher–student relationships: An examination of demographic characteristics, academic orientations, and behavioral orientations. *Psychology in the Schools*, *41*, 751–762. doi:10.1002/pits.20015
- Muthén, B. (2000). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modeling: New developments and techniques* (pp. 1–33). Hillsdale, NJ: Erlbaum.

- Muthén, L. K., & Muthén, B. O. (2012). MPlus: statistical analysis with latent variables--User's guide. Retrieved from: https://www.statmodel.com/html_ug.shtml
- Nantel-Vivier, A., Pihl, R. O., Côté, S., & Tremblay, R. E. (2014). Developmental association of prosocial behaviour with aggression, anxiety and depression from infancy to preadolescence. *Journal of Child Psychology and Psychiatry*, *55*, 1135–1144. doi: 10.1111/jcpp.12235
- Nelson, J. R., Benner, G. J., Neill, S., & Stage, S. (2006). Interrelationships among language skills, externalizing behavior, and academic fluency and their impact on the academic skills of students with ED. *Journal of Emotional and Behavioral Disorders*, *14*, 209–216. <http://dx.doi.org/10.1177/10634266060140040401>.
- Newman, D. L., Moffitt, T. E., Caspi, A., & Silva, P. A. (1998). Comorbid mental disorders: implications for treatment and sample selection. *Journal of Abnormal Psychology*, *107*, 305–311. doi:10.1037/0021-843X.107.2.305
- Nivard, M. G., Lubke, G. H., Dolan, C. V., Evans, D. M., Pourcain, B. S., Munafò, M. R., & Middeldorp, C. M. (2017). Joint developmental trajectories of internalizing and externalizing disorders between childhood and adolescence. *Development and Psychopathology*, *29*, 919–928. doi:10.1017/S0954579416000572
- Nurmi, J. E. (2012). Students' characteristics and teacher–child relationships in instruction: A meta-analysis. *Educational Research Review*, *7*, 177–197. doi:10.1016/j.edurev.2012.03.001
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation

- study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14, 535–569. doi: 10.1080/10705510701575396
- O'Connor, E. E., Dearing, E., & Collins, B. A. (2011). Teacher-child relationship and behavior problem trajectories in elementary school. *American Educational Research Journal*, 48, 120–162. doi:10.3102/0002831210365008
- O'Connor, E., & McCartney, K. (2007). Examining teacher-child relationships and achievement as part of an ecological model of development. *American Educational Research Journal*, 44, 340–369. doi:10.3102/0002831207302172
- 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, 90–102. doi: 10.1080/15374410903401120
- Oland, A. A., & Shaw, D. S. (2005). Pure versus co-occurring externalizing and internalizing symptoms in children: The potential role of socio-developmental milestones. *Clinical Child and Family Psychology Review*, 8, 247–270. doi:10.1007/s10567-005-8808-z
- Patterson, G. R., & Stoolmiller, M. (1991). Replications of a dual failure model for boys' depressed mood. *Journal of Consulting and Clinical Psychology*, 59, 491–498. doi: 10.1037/0022-006X.59.4.491
- Pianta, R. C. (1994). Patterns of relationships between children and kindergarten teachers. *Journal of School Psychology*, 32, 15–31. doi: 10.1016/0022-4405(94)90026-4
- Pianta, R. C., & Steinberg, M. S. (1992). Teacher-child relationships and the process of adjusting to school. *New Directions for Child Development*, 57, 61–80. doi: 10.1002/cd.23219925706

- Pianta, R. C., Steinberg, M. S., & Rollins, K. B. (1995). The first two years of school: Teacher-child relationships and deflections in children's classroom adjustment. *Development and Psychopathology*, *7*, 295–312. doi:10.1017/S0954579400006519
- Reijntjes, A., Kamphuis, J. H., Prinzie, P., & Telch, M. J. (2010). Peer victimization and internalizing problems in children: A meta-analysis of longitudinal studies. *Child Abuse & Neglect*, *34*, 244–252. doi: 10.1016/j.chiabu.2009.07.009
- Roeser, R. W., Eccles, J. S., & Sameroff, A. J. (1998). Academic and emotional functioning in early adolescence: Longitudinal relations, patterns, and prediction by experience in middle school. *Development and Psychopathology*, *10*, 321–352. doi: 10.1017/S0954579498001631
- Roeser, R. W., Van der Wolf, K., & Strobel, K. R. (2001). On the relation between social-emotional and school functioning during early adolescence: Preliminary findings from Dutch and American samples. *Journal of School Psychology*, *39*, 111–139. doi: 10.1016/S0022-4405(01)00060-7
- Roorda, D. L., Verschueren, K., Vancraeyveldt, C., Van Craeyevelt, S., & Colpin, H. (2014). Teacher-child relationships and behavioral adjustment: Transactional links for preschool boys at risk. *Journal of School Psychology*, *52*, 495–510. doi:10.1016/j.jsp.2014.06.004
- Rutter, M. (1989). Intergenerational continuities and discontinuities in serious parenting difficulties. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 317–348). New York: Cambridge University Press. doi:10.1017/CBO9780511665707.012

- Sabol, T. J., & Pianta, R. C. (2012). Patterns of school readiness forecast achievement and socioemotional development at the end of elementary school. *Child Development, 83*, 282–299. doi:10.1111/j.1467-8624.2011.01678.x
- Saft, E. W., & Pianta, R. C. (2001). Teachers' perceptions of their relationships with students: Effects of child age, gender, and ethnicity of teachers and children. *School Psychology Quarterly, 16*, 125–141. doi: 10.1521/scpq.16.2.125.18698
- Schwartz, D., Gorman, A. H., Nakamoto, J., & McKay, T. (2006). Popularity, social acceptance, and aggression in adolescent peer groups: Links with academic performance and school attendance. *Developmental Psychology, 42*, 1116–1127. doi:10.1037/0012-1649.42.6.1116
- Schwartz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics, 6*, 461–464. doi:10.1214/aos/1176344136
- Silver, R. B., Measelle, J. R., Armstrong, J. M., & Essex, M. J. (2005). Trajectories of classroom externalizing behavior: Contributions of child characteristics, family characteristics, and the teacher–child relationship during the school transition. *Journal of School Psychology, 43*, 39–60. doi:10.1016/j.jsp.2004.11.003
- Skalická, V., Belsky, J., Stenseng, F., & Wichstrøm, L. (2015). Reciprocal relations between student–teacher relationship and children's behavioral problems: Moderation by child-care group size. *Child Development, 86*, 1557–1570. doi: 10.1111/cdev.12400
- Sterba, S. K., Prinstein, M. J., & Cox, M. J. (2007). Trajectories of internalizing problems across childhood: Heterogeneity, external validity, and gender differences. *Development and Psychopathology, 19*, 345–366. doi:10.1017/S0954579407070174

- Sutherland, K. S., & Oswald, D. P. (2005). The relationship between teacher and student behavior in classrooms for students with emotional and behavioral disorders: Transactional processes. *Journal of Child and Family Studies, 14*, 1–14. doi: 10.1007/s10826-005-1106-z
- Texas Education Agency. (2004). TAKS information booklets. Retrieved January 9, 2009, from <http://www.tea.state.tx.us/student.assessment/taks/booklets/index.html>
- Vaillancourt, T., Brittain, H. L., 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*, 1203–1215. doi:10.1007/s10802-013-9781-5
- Van der Ende, J., Verhulst, F. C., & Tiemeier, H. (2016). The bidirectional pathways between internalizing and externalizing problems and academic performance from 6 to 18 years. *Development and Psychopathology, 28*, 855–867. doi: 10.1017/S0954579416000353
- 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*, 1775–1788. doi: 10.1111/j.1467-8624.2012.01802.x
- 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*, 247–257. doi:10.1037/a0032547

- Weeks, M., Cairney, J., Wild, T. C., Ploubidis, G. B., Naicker, K., & Colman, I. (2014). Early-life predictors of internalizing symptom trajectories in Canadian children. *Depression and Anxiety, 31*, 608–616. doi:10.1002/da.22235
- Wentzel, K. R. (2002). Are effective teachers like good parents? Teaching styles and student adjustment in early adolescence. *Child Development, 73*, 287–301. doi: 10.1037/0033-2909.101.3.443
- Whalen, D. J., Luby, J. L., Tilman, R., Mike, A., Barch, D., & Belden, A. C. (2016). Latent class profiles of depressive symptoms from early to middle childhood: predictors, outcomes, and gender effects. *Journal of Child Psychology and Psychiatry, 57*, 794–804. doi: 10.1111/jcpp.12518
- Wiggins, J. L., Mitchell, C., Hyde, L. W., & Monk, C. S. (2015). Identifying early pathways of risk and resilience: The codevelopment of internalizing and externalizing symptoms and the role of harsh parenting. *Development and Psychopathology, 27*, 1295–1312. doi: 10.1017/S0954579414001412
- Woltering, S., & Shi, Q. (2016). On the neuroscience of self-regulation in children with disruptive behavior problems: Implications for education. *Review of Educational Research, 86*(4), 1085–1110. doi: 10.3102/0034654316673722
- Woodcock, R. W., & Johnson, M. B. (1990). *Manual for the Woodcock–Johnson Tests of Achievement—Revised*. Allen, TX: RCL Enterprises.
- Woodcock, R. W., & Muñoz-Sandoval, A. F. (1993). *Woodcock–Muñoz Language Survey*. Chicago: Riverside.

- Woodcock, R. W., & Muñoz-Sandoval, A. F. (2001). Woodcock–Muñoz Language Survey Normative Update scoring and reporting program [Computer software]. Itasca, IL: Riverside Publishing.
- Woodcock, R. W., & Sandoval, A. F. M. (1996). *Batería Woodcock-muñoz: pruebas de aprovechamiento revisada*. Riverside Publishing Company.
- Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock–Johnson III Tests of Achievement*. Itasca, IL: Riverside Publishing.
- Wu, J. Y., & Hughes, J. N. (2015). Teacher Network of Relationships Inventory: Measurement invariance of academically at-risk students across ages 6 to 15. *School Psychology Quarterly, 30*, 23–36. doi:10.1037/spq0000063
- Wyrick, A. J., & Rudasill, K. M. (2009). Parent involvement as a predictor of teacher–child relationship quality in third grade. *Early Education and Development, 20*, 845–864. doi:10.1080/10409280802582803
- Zimmermann, F., Schütte, K., Taskinen, P., & Köller, O. (2013). Reciprocal effects between adolescent externalizing problems and measures of achievement. *Journal of Educational Psychology, 105*, 747–761. doi:10.1037/a0032793

5. CONCLUSIONS

The aim of this dissertation were threefold. The *first* aim was to examine the conceptualization and operationalization of co-occurring internalizing and externalizing problems with both variable and person-centered approaches. The *second* aim was to examine predictive effects of various early childhood individual and contextual factors on the distinct co-occurring patterns. The *third* aim was to examine the longitudinal associations of school adjustments with distinct co-occurring patterns.

5.1. Aim 1: Conceptualization and Operationalization of the Co-occurring Internalizing and Externalizing Problems from Both Variable and Person-centered Approach

The first study aims to utilize the Strengths and Difficulties Questionnaire (SDQ), a frequently used instrument developed for screening childhood and adolescence mental health problems, to concept and operate the co-occurring patterns of internalizing and externalizing problems. We conducted both variable and person-centered approach on the development of co-occurring psychopathology from early childhood to late adolescence with both parent and teacher ratings. From the evidence with both two approaches, children and adolescence present a complex picture of co-occurring affective (emotional problems), behavioral (conduct problems), and cognitive (hyperactivity-inattention) psychopathological symptoms. This study provided evidence as how we can measure this complex phenotype of co-occurred problems, and thereby improve our understanding of it nature and development.

5.2. Aim 2: The Predictive Effect of Early Childhood Factors on the Development of Co-occurring Problems

As internalizing and externalizing problems often co-occur, study 2 study utilized a longitudinal dataset of 784 at-risk children (predominantly from low-income families and academically at-risk; 52.6% male) followed yearly from grade 1 to grade 12 to: (a) explore the heterogeneity in the co-development patterns of internalizing and externalizing problems by using a person-centered approach, and (b) investigate early childhood antecedents that might explain differentiated co-developmental patterns. The antecedents consisted of individual (i.e., ego-resilient personality, intelligence, language ability, gender, and ethnicity) and contextual factors (i.e., maternal support and responsiveness, family socioeconomic adversity, teacher-child relationship conflict, and peer rejection). We identified four distinct co-development patterns including a chronic co-occurring group (30.1%), a moderate co-occurring group (28.5%), a pure-externalizing group (18.6%), and a low-risk group (22.8%). While children who belonged to any of the three higher risk groups exhibited more adverse early childhood antecedents compared with the low-risk group, the chronic co-occurring group displayed the most severe profiles of early childhood antecedents compared to the moderate co-occurring and the pure-externalizing groups. Common antecedents for the three higher risk groups were lower ego-resilient personality, higher teacher-child relationship conflict, being male and being African-American. Low language ability and peer rejection were identified as unique antecedents for the chronic co-occurring group.

5.3. Aim 3: Longitudinal Associations between School Adjustments with Co-occurring Problems

Study 3 examined patterns of co-developing internalizing and externalizing problems from early childhood through adolescence (i.e., grades 1 to 12). Subgroups of children with heterogeneous developmental trajectories (i.e., pure and co-occurring internalizing and externalizing problems) were identified and their long-term associations with teacher-child relationship quality and academic (math and reading) performance were assessed. Findings were based on a sample of 784 children (52.6% girls) who were followed from grade 1 ($M_{age}=6.57$) to grade 12 ($M_{age}=17.57$). Children's internalizing problems, externalizing problems, and teacher-child relationship quality were assessed annually from grades 1 to 12, and their academic performance was assessed from grades 1 to 9. Results revealed four distinct trajectories of internalizing and externalizing problems including chronic co-occurring, moderate co-occurring, pure-externalizing, and low-risk groups. Children with chronic co-occurring internalizing and externalizing problems exhibited more sustained teacher-child conflict, lower teacher-child warmth, and lower math and reading performance. Children with pure externalizing and moderate co-occurring problems were also at risk for scholastic difficulties, but to a lesser magnitude than children with chronic co-occurring problems. Compared to children in the low risk group, those in all three risk groups exhibited patterns of scholastic maladjustment that were either sustained or worsened after the transition to middle school.

APPENDIX A

Table S1. Model Fit Indices of the Confirmatory Factor Analysis for 10-item Externalizing and 5-item Internalizing Problems

	Grade	RMSEA	RMSEA CI	CFI	TLI	SRMR
Externalizing problems	G1	0.032	[0.000-0.059]	0.968	0.978	0.013
	G2	0.021	[0.000-0.059]	0.969	0.974	0.015
	G3	0.050	[0.023-0.078]	0.964	0.968	0.023
	G4	0.042	[0.000-0.073]	0.976	0.977	0.019
	G5	0.049	[0.024-0.074]	0.983	0.970	0.025
	G6	0.045	[0.004-0.077]	0.965	0.976	0.024
	G7	0.028	[0.000-0.052]	0.965	0.970	0.026
	G8	0.030	[0.000-0.055]	0.964	0.967	0.027
	G9	0.043	[0.018-0.066]	0.975	0.967	0.038
	G10	0.020	[0.000-0.048]	0.957	0.964	0.026
	G12	0.042	[0.017-0.064]	0.955	0.963	0.036
	Internalizing problems	G1	0.049	[0.017-0.082]	0.971	0.962
G2		0.046	[0.008-0.081]	0.980	0.960	0.024
G3		0.039	[0.000-0.102]	0.974	0.972	0.014
G4		0.013	[0.000-0.063]	0.959	0.968	0.016
G5		0.050	[0.000-0.092]	0.958	0.970	0.021
G6		0.010	[0.000-0.038]	0.969	0.969	0.010
G7		0.033	[0.000-0.080]	0.970	0.969	0.024
G8		0.047	[0.000-0.090]	0.954	0.968	0.031
G9		0.054	[0.000-0.098]	0.964	0.947	0.030
G10		0.074	[0.037-0.114]	0.951	0.921	0.032
G12		0.010	[0.000-0.051]	0.959	0.969	0.017

Note. RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, SRMR = Standardized Root Mean Square Residual.

Table S2. Measurement Invariance of the 10-item Externalizing and 5-item Internalizing Problems across Time

	χ^2	<i>df</i>	<i>RMSEA</i>	<i>RMSEA 90% CI</i>	<i>CFI</i>	<i>TLI</i>	Δdf	$\Delta \chi^2$	ΔCFI	$\Delta RMSEA$	
Externalizing problems											
Model 1: Configural Invariance	1004.580	534	0.034	[.031 - .037]	0.950	0.927					
Model 2: Metric Invariance	1094.604	561	0.036	[.032 - .039]	0.943	0.921	27	90.02	0.007	0.002	
Model 3: Scalar Invariance	1320.391	591	0.040	[.038 - .043]	0.932	0.907	30	225.79	0.011	0.004	
Internalizing problems											
Model 1: Configural Invariance	200.985	134	0.026	[.018 - .033]	0.963	0.948					
Model 2: Metric Invariance	252.987	146	0.031	[.025 - .038]	0.951	0.934	12	52.00	0.012	0.005	
Model 3: Scalar Invariance	368.675	161	0.041	[.036 - .047]	0.923	0.912	15	115.69	0.028	0.010	

RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, df = degree freedom.

Note: Externalizing problem contains both conduct problems and hyperactivity-inattention scales, and internalizing problem contains only emotional problems

Table S3. Percentage of Sample with Varying Levels of Problem Behaviors (conduct problems, hyperactivity-inattention, and emotion problems) Based on *the* Newer Four-band Categorization Scheme Adopted from the Strengths and Difficulties Questionnaire (SDQ) Manual

		close to average	Slightly raised	High	Very high
Conduct problems	G1	70.50%	8.70%	7.70%	13.00%
	G2	72.70%	5.70%	7.30%	14.50%
	G3	73.10%	6.80%	8.00%	12.10%
	G4	74.60%	6.60%	4.70%	14.10%
	G5	73.90%	5.90%	5.90%	14.20%
	G6	74.70%	5.90%	6.40%	13.00%
	G7	76.70%	7.70%	5.80%	9.90%
	G8	79.60%	6.20%	4.60%	9.60%
	G9	82.80%	7.10%	3.40%	6.70%
	G10	81.10%	4.80%	4.60%	9.30%
	G12	84.90%	5.40%	2.80%	6.90%
	Hyperactivity-In attention	G1	66.10%	11.20%	6.50%
G2		68.30%	13.60%	4.20%	13.90%
G3		66.00%	14.40%	3.80%	15.80%
G4		69.90%	12.50%	5.50%	12.20%
G5		72.80%	11.10%	5.90%	10.20%
G6		71.10%	14.40%	5.20%	10.30%
G7		73.50%	13.30%	4.20%	9.10%
G8		78.00%	11.70%	3.40%	6.90%
G9		81.00%	10.40%	2.70%	5.90%
G10		78.00%	11.70%	3.40%	6.90%
G12		80.80%	9.20%	3.60%	6.40%
Emotion problems		G1	77.80%	8.10%	6.60%
	G2	82.00%	7.40%	4.30%	6.30%
	G3	83.00%	7.10%	3.50%	6.40%
	G4	78.20%	8.30%	4.90%	8.50%
	G5	83.20%	6.70%	3.00%	7.30%
	G6	87.00%	4.30%	3.60%	5.10%
	G7	89.50%	4.20%	3.00%	3.20%
	G8	91.10%	3.90%	2.50%	2.50%
	G9	91.40%	2.50%	1.50%	4.70%
	G10	90.10%	3.00%	2.30%	4.50%
	G12	91.00%	3.80%	1.80%	3.30%

Note: “valid percent” was reported. According to the manual, based on a larger UK community sample, 80% ‘close to average’, 10% ‘slightly raised’, 5% ‘high’ and 5% ‘very high’ for all scales.

Table S4. Categorized Sample Based on the Woodcock-Johnson III Age-standardized Score

Academic performance	Grade level	Above average	Average	Below Average
Reading	G1	20%	45%	35%
	G2	19%	50%	31%
	G3	11%	61%	28%
	G4	11%	60%	30%
	G5	12%	60%	29%
	G6	12%	58%	30%
	G7	13%	58%	29%
	G8	14%	56%	30%
	G9	15%	56%	29%
Math	G1	26%	53%	20%
	G2	21%	61%	18%
	G3	21%	61%	17%
	G4	20%	64%	15%
	G5	16%	67%	17%
	G6	15%	70%	16%
	G7	14%	67%	19%
	G8	13%	63%	23%
	G9	10%	58%	32%

Note: According to the manual, scores greater than 111 are “Above Average” (reflecting a percentile rank from 76 to 99.9); scores ranging from 90 to 110 are “Average” (reflecting a percentile rank from 25 to 75); and scores below 89 are “Below Average” (reflecting a percentile rank from 0.1 to 24).

Table S5. Correlation Matrix of Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
1. Int (1)	1																						
2. Int (2)	.25**	1																					
3. Int (3)	.23**	.20**	1																				
4. Int (4)	.25**	.19**	.24**	1																			
5. Int (5)	.24**	.22**	.24**	.30**	1																		
6. Int (6)	.19**	.35**	.14*	.24**	.35**	1																	
7. Int (7)	.14**	.31**	0.05	.29**	.26**	.31**	1																
8. Int (8)	.15**	.25**	0.09	.15**	.31**	.30**	.25**	1															
9. Int (9)	0.1	0.09	0.1	.13*	.17**	.14*	.14*	.26**	1														
10. Int (10)	.19**	.22**	0.09	.19**	.14*	.25**	.25**	.25**	.25**	1													
11. Int (12)	.21**	.11*	0.09	.22**	.19**	.15**	.33**	.13*	0.14	.32**	1												
12. Ext (1)	.31**	.18**	0.08	.16**	.15**	.26**	.12*	.19**	0.1	.18**	.14**	1											
13. Ext (2)	.15**	.38**	.15**	.17**	.20**	.27**	.16**	.17**	-0.02	.22**	0.09	.64**	1										
14. Ext (3)	.16**	.18**	.30**	.21**	.16**	.15**	.19**	.14**	.14*	.12*	0.12	.60**	.65**	1									
15. Ext (4)	.16**	.18**	.16**	.38**	.18**	.25**	.19**	.20**	0.09	.17**	.15**	.58**	.64**	.67**	1								
16. Ext (5)	.15**	.19**	.12*	.21**	.36**	.24**	.12*	.23**	.15**	.13*	0.1	.57**	.60**	.64**	.66**	1							
17. Ext (6)	.13**	.16**	0.01	.18**	.28**	.39**	.20**	.32**	.17**	.23**	.17**	.49**	.55**	.53**	.59**	.66**	1						
18. Ext (7)	.13*	.21**	0.04	.11*	.22**	.19**	.34**	.18**	0.07	.14**	.15**	.44**	.49**	.47**	.44**	.48**	.54**	1					
19. Ext (8)	0.04	.11*	0.07	.12*	.21**	.19**	.16**	.33**	.15**	.19**	0.03	.44**	.43**	.48**	.46**	.52**	.56**	.59**	1				
20. Ext (9)	0.05	.12*	0.08	0.1	.13*	0.11	0.08	.19**	.26**	0.09	0.05	.36**	.35**	.45**	.41**	.39**	.40**	.50**	.54**	1			
21. Ext (10)	.18**	0.1	0.03	0.1	0.1	.21**	.15**	.14**	.17**	.42**	.20**	.49**	.41**	.45**	.47**	.44**	.46**	.42**	.47**	.48**	1		
22. Ext (12)	.15**	-0.01	0.02	0.03	0.04	0.05	0.1	0.1	0.04	0.09	.34**	.36**	.28**	.29**	.30**	.31**	.32**	.40**	.47**	.31**	.39**	1	

Table S5 Continued. Correlation Matrix of Study Variables

	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
23. warm(1)	1																						
24. warm(2)	.41**	1																					
25. warm(3)	.28**	.37**	1																				
26. warm(4)	.25**	.32**	.34**	1																			
27. warm(5)	.29**	.23**	.39**	.35**	1																		
28. warm(6)	.27**	.27**	.32**	.34**	.41**	1																	
29. warm(7)	.18**	.21**	.15**	.20**	.25**	.34**	1																
30. warm(8)	.16**	.18**	.16**	.26**	.21**	.32**	.38**	1															
31. warm(9)	0.08	0.07	.17**	.19**	.15**	.19**	.23**	.17**	1														
32. warm(10)	0.1	.15**	.14*	0.11	0.08	0.1	.20**	0.05	.16**	1													
33. warm(12)	0.02	0.02	0.083	0.085	-0.01	0.08	0.11	.16**	0.08	0.1	1												
34. conflict(1)	-.65**	-.38**	-.31**	-.32**	-.33**	-.26**	-.21**	-.21**	-.13*	-0.07	0.01	1											
35. conflict(2)	-.44**	-.67**	-.39**	-.36**	-.32**	-.33**	-.29**	-.20**	-0.1	-.19**	-0.04	.56**	1										
36. conflict(3)	-.38**	-.37**	-.56**	-.42**	-.34**	-.33**	-.26**	-.28**	-.18**	-.14*	-0.03	.52**	.56**	1									
37. conflict(4)	-.33**	-.44**	-.43**	-.58**	-.30**	-.36**	-.27**	-.25**	-.21**	-0.06	-0.08	.50**	.58**	.61**	1								
38. conflict(5)	-.32**	-.36**	-.42**	-.45**	-.57**	-.38**	-.28**	-.28**	-.16**	-.20**	0.01	.50**	.56**	.55**	.58**	1							
39. conflict(6)	-.27**	-.35**	-.36**	-.32**	-.38**	-.59**	-.26**	-.28**	-.19**	-0.1	-0.07	.37**	.45**	.51**	.54**	.58**	1						
40. conflict(7)	-.28**	-.29**	-.19**	-.21**	-.21**	-.31**	-.57**	-.27**	-.13*	-.17**	-0.05	.34**	.39**	.44**	.39**	.36**	.40**	1					
41. conflict(8)	-.27**	-.19**	-.16**	-.28**	-.19**	-.23**	-.31**	-.52**	-.15**	-0.08	-0.11	.38**	.29**	.43**	.40**	.46**	.44**	.38**	1				
42. conflict(9)	-.13*	-.17**	-.25**	-.12*	-.14*	-.15**	-.26**	-.21**	-.49**	-.17**	-.15*	.21**	.25**	.34**	.31**	.29**	.30**	.29**	.36**	1			
43. conflict(10)	-.11*	-0.06	-0.1	-0.08	-0.05	-0.07	-.14*	-0.08	-.15**	-.55**	-0.07	.11*	.14**	.22**	.13*	.12*	.14*	.16**	.20**	.26**	1		
44. conflict(12)	-0.09	-0.09	-0.1	-0.07	-0.05	-.14*	-.16**	-.20**	-0.07	-0.07	-.58**	.12*	.14**	.15**	.13*	.12*	.15*	.15*	.24**	.24**	0.04	1	

Table S5 Continued. Correlation Matrix of Study Variables

	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	
45. reading(1)	1																		
46. reading(2)	.78**	1																	
47. reading(3)	.74**	.84**	1																
48. reading(4)	.68**	.80**	.87**	1															
49. reading(5)	.61**	.76**	.83**	.88**	1														
50. reading(6)	.59**	.68**	.76**	.84**	.87**	1													
51. reading(7)	.61**	.67**	.75**	.82**	.87**	.93**	1												
52. reading(8)	.57**	.61**	.69**	.76**	.82**	.89**	.93**	1											
53. reading(9)	.56**	.60**	.68**	.76**	.81**	.90**	.93**	.94**	1										
54. math(1)	.54**	.45**	.44**	.46**	.46**	.54**	.59**	.57**	.56**	1									
55. math(2)	.49**	.55**	.52**	.55**	.54**	.61**	.62**	.60**	.60**	.76**	1								
56. math(3)	.56**	.56**	.59**	.58**	.58**	.64**	.66**	.64**	.64**	.72**	.80**	1							
57. math(4)	.55**	.56**	.60**	.63**	.60**	.67**	.68**	.66**	.66**	.65**	.77**	.85**	1						
58. math(5)	.47**	.49**	.55**	.58**	.60**	.65**	.66**	.66**	.66**	.64**	.73**	.78**	.83**	1					
59. math(6)	.49**	.53**	.57**	.62**	.62**	.72**	.71**	.73**	.72**	.64**	.71**	.76**	.83**	.85**	1				
60. math(7)	.50**	.55**	.58**	.64**	.64**	.70**	.73**	.72**	.72**	.67**	.73**	.78**	.82**	.84**	.89**	1			
61. math(8)	.46**	.51**	.52**	.58**	.62**	.66**	.69**	.72**	.70**	.62**	.69**	.74**	.79**	.84**	.86**	.91**	1		
62. math(9)	.44**	.48**	.51**	.56**	.572**	.65**	.68**	.68**	.70**	.62**	.69**	.72**	.77**	.81**	.84**	.90**	.92**	1	

Table S5 Continued. Correlation Matrix of Study Variables

	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
23. warm(1)	1																						
24. warm(2)	.41*	1																					
25. warm(3)	.28*	.37**	1																				
26. warm(4)	.25*	.32**	.34**	1																			
27. warm(5)	.29*	.23**	.39**	.35**	1																		
28. warm(6)	.27*	.27**	.32**	.34**	.41**	1																	
29. warm(7)	.18*	.21**	.15**	.20**	.25**	.34**	1																
30. warm(8)	.16*	.18**	.16**	.26**	.21**	.32**	.38**	1															
31. warm(9)	0.08	0.07	.17**	.19**	.15**	.19**	.23**	.17**	1														
32. warm(10)	0.1	.15**	.14*	0.11	0.08	0.1	.20**	0.05	.16**	1													
33. warm(12)	0.02	0.02	0.083	0.085	-0.01	0.08	0.11	.16**	0.08	0.1	1												
34. conflict(1)	-.65**	-.38**	-.31**	-.32**	-.33**	-.26**	-.21**	-.21**	-.13*	-0.07	0.01	1											
35. conflict(2)	-.44**	-.67**	-.39**	-.36**	-.32**	-.33**	-.29**	-.20**	-0.1	-.19**	-0.04	.56**	1										
36. conflict(3)	-.38**	-.37**	-.56**	-.42**	-.34**	-.33**	-.26**	-.28**	-.18**	-.14*	-0.03	.52**	.56**	1									
37. conflict(4)	-.33**	-.44**	-.43**	-.58**	-.30**	-.36**	-.27**	-.25**	-.21**	-0.06	-0.08	.50**	.58**	.61**	1								
38. conflict(5)	-.32**	-.36**	-.42**	-.45**	-.57**	-.38**	-.28**	-.28**	-.16**	-.20**	0.01	.50**	.56**	.55**	.58**	1							
39. conflict(6)	-.27**	-.35**	-.36**	-.32**	-.38**	-.59**	-.26**	-.28**	-.19**	-0.1	-0.07	.37**	.45**	.51**	.54**	.58**	1						
40. conflict(7)	-.28**	-.29**	-.19**	-.21**	-.21**	-.31**	-.57**	-.27**	-.13*	-.17**	-0.05	.34**	.39**	.44**	.39**	.36**	.40**	1					
41. conflict(8)	-.27**	-.19**	-.16**	-.28**	-.19**	-.23**	-.31**	-.52**	-.15**	-0.08	-0.11	.38**	.29**	.43**	.40**	.46**	.44**	.38**	1				
42. conflict(9)	-.13*	-.17**	-.25**	-.12*	-.14*	-.15**	-.26**	-.21**	-.49**	-.17**	-.15*	.21**	.25**	.34**	.31**	.29**	.30**	.29**	.30**	1			
43. conflict(10)	-.11*	-0.06	-0.1	-0.08	-0.05	-0.07	-.14*	-0.08	-.15**	-.55**	-0.07	.11*	.14**	.22**	.13*	.12*	.14*	.16**	.20**	.26**	1		
44. conflict(12)	-.09	-0.09	-0.1	-0.07	-0.05	-.14*	-.16**	-.20**	-0.07	-0.07	-.58**	.12*	.14**	.15**	.13*	.12*	.15*	.15*	.24**	.24**	0.04	1	

Table S5 Continued. Correlation Matrix of Study Variables

	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	
45. reading(1)	1																		
46. reading(2)	.78**	1																	
47. reading(3)	.74**	.84**	1																
48. reading(4)	.68**	.80**	.87**	1															
49. reading(5)	.61**	.76**	.83**	.88**	1														
50. reading(6)	.59**	.68**	.76**	.84**	.87**	1													
51. reading(7)	.61**	.67**	.75**	.82**	.87**	.93**	1												
52. reading(8)	.57**	.61**	.69**	.76**	.82**	.89**	.93**	1											
53. reading(9)	.56**	.60**	.68**	.76**	.81**	.90**	.93**	.94**	1										
54. math(1)	.54**	.45**	.44**	.46**	.46**	.54**	.59**	.57**	.56**	1									
55. math(2)	.49**	.55**	.52**	.55**	.54**	.61**	.62**	.60**	.60**	.76**	1								
56. math(3)	.56**	.56**	.59**	.58**	.58**	.64**	.66**	.64**	.64**	.72**	.80**	1							
57. math(4)	.55**	.56**	.60**	.63**	.60**	.67**	.68**	.66**	.66**	.65**	.77**	.85**	1						
58. math(5)	.47**	.49**	.55**	.58**	.60**	.65**	.66**	.66**	.66**	.64**	.73**	.78**	.83**	1					
59. math(6)	.49**	.53**	.57**	.62**	.62**	.72**	.71**	.73**	.72**	.64**	.71**	.76**	.83**	.85**	1				
60. math(7)	.50**	.55**	.58**	.64**	.64**	.70**	.73**	.72**	.72**	.67**	.73**	.78**	.82**	.84**	.89**	1			
61. math(8)	.46**	.51**	.52**	.58**	.62**	.66**	.69**	.72**	.70**	.62**	.69**	.74**	.79**	.84**	.86**	.91**	1		
62. math(9)	.44**	.48**	.51**	.56**	.572**	.65**	.68**	.68**	.70**	.62**	.69**	.72**	.77**	.81**	.84**	.90**	.92**	1	

Table S5 Continued. Correlation Matrix of Study Variables

	23	24	25	26	27	28	29	30	31	32	33
Int(1)	-.318**	-.108*	-.146**	-.031	-.077	-.160**	-.095	.006	-.123*	-.016	.067
Int(2)	-.144**	-.200**	-.194**	-.094*	-.147**	-.191**	-.098	.017	-.128*	.006	.054
Int(3)	-.097*	-.112*	-.256**	-.081	-.157**	-.121*	.025	.004	-.169**	-.099	.021
Int(4)	-.162**	-.163**	-.185**	-.243**	-.127*	-.191**	-.064	-.073	-.123*	-.099	.079
Int(5)	-.126**	-.072	-.138**	-.101*	-.184**	-.350**	-.117*	-.097	-.109*	-.104	.040
Int(6)	-.280**	-.195**	-.129*	-.133*	-.185**	-.276**	-.089	-.112*	-.066	.035	-.085
Int(7)	-.090	-.039	-.178**	-.169**	-.106*	-.246**	-.163**	-.140**	-.177**	-.107	-.101
Int(8)	-.117*	-.136**	-.101	-.178**	-.165**	-.250**	-.105*	-.103*	-.150**	-.042	.052
Int(9)	-.054	.009	-.053	-.094	-.085	-.184**	.012	-.024	-.173**	-.016	-.091
Int(10)	-.214**	-.147**	-.159**	-.149**	-.216**	-.188**	-.160**	-.148**	-.028	-.143**	-.087
Int(12)	-.238**	.051	-.052	-.118*	-.232**	-.188**	-.117*	.038	-.106	-.100	-.196**
	23	24	25	26	27	28	29	30	31	32	33
Ext(1)	-.672**	-.441**	-.387**	-.337**	-.341**	-.325**	-.223**	-.227**	-.183**	-.092	-.107*
Ext(2)	-.479**	-.623**	-.465**	-.408**	-.402**	-.408**	-.288**	-.200**	-.111*	-.174**	-.093
Ext(3)	-.371**	-.426**	-.584**	-.474**	-.433**	-.379**	-.258**	-.260**	-.204**	-.123*	-.093
Ext(4)	-.363**	-.463**	-.453**	-.621**	-.398**	-.413**	-.263**	-.278**	-.194**	-.112*	-.116*
Ext(5)	-.382**	-.385**	-.501**	-.435**	-.582**	-.477**	-.280**	-.304**	-.215**	-.188**	-.025
Ext(6)	-.326**	-.369**	-.399**	-.393**	-.437**	-.607**	-.336**	-.339**	-.192**	-.138*	-.187**
Ext(7)	-.320**	-.375**	-.268**	-.256**	-.300**	-.394**	-.601**	-.374**	-.246**	-.174**	-.141*
Ext(8)	-.325**	-.284**	-.280**	-.340**	-.271**	-.354**	-.381**	-.574**	-.259**	-.126*	-.125*
Ext(9)	-.203**	-.252**	-.270**	-.245**	-.193**	-.208**	-.307**	-.278**	-.534**	-.179**	-.205**
Ext(10)	-.388**	-.298**	-.279**	-.245**	-.239**	-.248**	-.331**	-.247**	-.243**	-.228**	-.070
Ext(12)	-.299**	-.090	-.112	-.149**	-.139*	-.155**	-.289**	-.270**	-.183**	-.109	-.431**

Table S5 Continued. Correlation Matrix of Study Variables

	34	35	36	37	38	39	40	41	42	43	44
Int(1)	.201**	.084*	.125**	.107*	.047	.098	.038	.002	.059	.027	.013
Int(2)	.132**	.241**	.148**	.117*	.133**	.105*	.135**	.002	.076	-.076	.008
Int(3)	.074	.061	.149**	.105*	.050	.078	.019	.026	.042	-.001	-.049
Int(4)	.163**	.115*	.120*	.228**	.123*	.093	.063	.095	-.001	.012	-.028
Int(5)	.156**	.115*	.126*	.096	.188**	.203**	.141**	.106*	.114*	.141**	-.018
Int(6)	.206**	.209**	.151**	.201**	.169**	.232**	.171**	.111*	.024	-.026	.043
Int(7)	.075	.051	.180**	.100	.090	.142**	.202**	.062	.062	.003	.084
Int(8)	.144**	.165**	.081	.173**	.149**	.245**	.145**	.172**	.089	.132*	-.068
Int(9)	.049	-.001	.054	.054	.129*	.202**	.030	.102	.157**	.017	.057
Int(10)	.174**	.130*	.080	.145**	.095	.189**	.086	.155**	.021	.174**	.038
Int(12)	.110*	.005	.041	.022	.060	.125*	.090	.028	.018	.060	.221**
	34	35	36	37	38	39	40	41	42	43	44
Ext(1)	.802**	.574**	.535**	.525**	.461**	.402**	.336**	.349**	.227**	.114*	.172**
Ext(2)	.573**	.771**	.562**	.579**	.542**	.473**	.385**	.309**	.218**	.144**	.168**
Ext(3)	.508**	.573**	.800**	.635**	.553**	.477**	.401**	.393**	.312**	.183**	.188**
Ext(4)	.536**	.563**	.587**	.796**	.577**	.531**	.385**	.398**	.275**	.160**	.166**
Ext(5)	.560**	.543**	.597**	.584**	.773**	.558**	.378**	.460**	.280**	.174**	.119*
Ext(6)	.421**	.477**	.513**	.539**	.584**	.793**	.445**	.450**	.250**	.136*	.219**
Ext(7)	.394**	.462**	.474**	.418**	.443**	.467**	.786**	.431**	.389**	.170**	.230**
Ext(8)	.425**	.396**	.467**	.436**	.489**	.479**	.470**	.800**	.416**	.229**	.234**
Ext(9)	.299**	.325**	.390**	.400**	.341**	.356**	.366**	.422**	.764**	.260**	.235**
Ext(10)	.463**	.388**	.438**	.473**	.436**	.453**	.332**	.445**	.358**	.388**	.149*
Ext(12)	.366**	.275**	.304**	.288**	.296**	.285**	.331**	.378**	.283**	.177**	.512**

Note. Int = Internalizing behaviors, Ext = Externalizing behaviors. Numbers in parentheses refer to the grade level. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S6. Categorized Sample Based on the Woodcock-Johnson III Age-standardized Score For All Four Class in Comparisons

Academic performance	Grade level	Above average	Average	Below Average	Above average	Average	Below Average	Above average	Average	Below Average	Above average	Average	Below Average
Trajectory class		Chronic co-occurring			Pure-externalizing			Moderate co-occurring			No risk		
Reading	G1	11%	42%	47%	23%	39%	38%	20%	47%	34%	29%	51%	20%
	G2	13%	42%	46%	15%	55%	30%	22%	49%	29%	26%	58%	16%
	G3	8%	51%	41%	8%	65%	27%	11%	66%	23%	17%	67%	16%
	G4	6%	52%	42%	7%	64%	29%	13%	58%	29%	16%	68%	16%
	G5	6%	53%	41%	10%	64%	26%	11%	61%	27%	21%	62%	17%
	G6	8%	47%	44%	14%	59%	27%	10%	63%	28%	18%	63%	18%
	G7	5%	48%	47%	12%	63%	25%	9%	63%	28%	27%	60%	12%
	G8	6%	47%	47%	12%	62%	26%	11%	63%	26%	29%	56%	15%
	G9	6%	46%	49%	12%	68%	20%	14%	59%	27%	32%	54%	14%
Math	G1	16%	51%	33%	28%	57%	14%	25%	56%	19%	38%	50%	11%
	G2	9%	62%	29%	24%	63%	13%	20%	62%	18%	34%	58%	8%
	G3	11%	60%	29%	23%	66%	11%	22%	61%	17%	33%	59%	8%
	G4	10%	66%	24%	21%	70%	10%	19%	63%	18%	36%	60%	5%
	G5	6%	65%	29%	14%	72%	13%	18%	68%	14%	27%	66%	7%
	G6	6%	62%	32%	18%	72%	11%	11%	76%	14%	27%	70%	3%
	G7	7%	58%	36%	13%	72%	15%	10%	75%	14%	27%	66%	7%
	G8	4%	59%	37%	13%	64%	24%	12%	68%	20%	26%	64%	11%
	G9	2%	44%	54%	12%	62%	26%	10%	63%	27%	19%	65%	17%

Note: According to the manual, scores greater than 111 are “Above Average” (reflecting a percentile rank from 76 to 99.9); scores ranging from 90 to 110 are “Average” (reflecting a percentile rank from 25 to 75); and scores below 89 are “Below Average” (reflecting a percentile rank from 0.1 to 24).