Co-development of internalizing and externalizing behaviors during middle childhood and potential moderators of the process

Nan Chen

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

In

Psychology

Kirby Deater-Deckard, Chair

Martha Ann Bell

Jungmeen Kim-Spoon

Bradley White

September 19, 2014

Blacksburg, Virginia

Key words: Co-development, internalizing problems, externalizing problems

Co-development of internalizing and externalizing behaviors during middle childhood and potential moderators of the process

Nan Chen

ABSTRACT

Child internalizing and externalizing problems co-vary during development and lead to maladjustment outcomes, such as substance abuse, academic failure, antisocial behaviors and psychopathology. The proposed study aims to examine the co-development process of internalizing and externalizing problems during middle childhood and the potential moderators of this reciprocal relationship. Children and their families recruited in the Study of Early Childhood Care and Youth Development (SECCYD) constitute the sample of the current study. Participants in the study were recruited from nine states in the United States and followed from birth to adolescence. Though a few studies have examined the developmental trajectories of internalizing and externalizing problems over time, the findings are not consistent in terms of the directions of the relationship and very few have examined individual difference in the co-development process. To address this gap in knowledge, two moderating effects are examined, with one moderator being time-invariant, i.e., children's gender, and the other moderator being time-variant, i.e. parent-child conflicts. Longitudinal growth modeling and longitudinal difference score modeling are used to examine the dynamic relationship and the moderating effects. Comparisons of the two approaches are made with respect to the specific hypotheses of change tested by each model, model convergence, parameter and fit estimates, and the interpretation of the results.

Acknowledgement

I want to express my gratitude towards many people for their generous help which carry me through my graduate study at Virginia Tech.

First, I want to thank my parents for their support, encouragement and above all their unconditional love, which sometimes can make me feel a little pressured. As much as I want to pay them back with equal love and patience, it is hard to achieve that goal based on the knowledge of evolution.

Next, I want to thank my advisor, Dr. Kirby Deater-Deckard, for offering me the opportunity to come to the States and to become a member of his awesome IDDLab. I am not an ideal student, but I am blessed to have an ideal advisor. This again proves that life is not fair, and this time it is not fair in my favor. Besides his generous help and support on my graduate study, I feel I have learned more from him about life and the importance of a good attitude, which probably makes all the difference. In the future, I will try to be optimistic and sober instead of being sober and depressed.

I also owe many thanks to my wonderful committee members. I want to thank Dr. Martha Ann Bell, Dr. Jungmeen Kim-Spoon and Dr. Bradley White for their great support and valuable suggestions on my dissertation, for their quick responses to my many questions and requests, and for their generously making time to meet with me and offer guidance on my work.

In addition, I want to thank my great labmates and fellow graduate students Zhe Wang, Shereen El Mallah, Mengjiao Li, Naama Atzaba Poria, Julee Farley, Derek Sprangler and Xiao Yang for the various help and/or encouragement during my

graduate study.

Last but not the least, I also want to express my great appreciation for the support from the department head Bob Stephens, graduate program director Julie Dunsmore and the department staff: Susan Armstrong, Ben Pfountz, Kim Raymond and Vicki Thompson.

Table of Contents

List of Tables

List of Figures

Chapter 1 - Introduction

1.1 - Overview of the development of internalizing and externalizing problems

Internalizing and externalizing problems during development are closely related to children's social incompetence, academic failure and an overall low level of wellbeing (Vaillancourt, Brittain, McDougall, & Duku, 2013). Internalizing problems refer to the emotion related problems of children during the development, such as anxiety, depression and social withdrawn. Externalizing problems refer to the behavior problems, such as aggression, delinquency and antisocial behaviors. Past studies showed that the development of internalizing and externalizing problems was not independent but intertwined (Keiley, Lofthouse, Bates, Doge & Petit, 2003; Lilienfeld, 2003). However, it is still not clear how they influence the development of each other overtime as studies suggested controversial results (Hink et al., 2013). Some studies found the leading effect of externalizing problems on internalizing problems (Boylan, Vaillancourt, Boyle, & Szatmari, 2007; Nock, Kazdin, Hiripi, & Kessler, 2007), while others found the opposite (Fanti, Henrich, Brookmeyer, and Kuperminc, 2008; Ritakallio et al., 2008). Furthermore, there were also some studies suggesting that a reciprocal relationship exist between problems in these two domains (Gilliom & Shaw, 2004; Keiley, Bates, Dodge & Pettit, 2000; Measelle, Stice & Hogansen, 2006). The controversies in findings imply that, when it comes to the dynamic relationship between internalizing and externalizing problems, there may be some personal and environmental factors that differentiate individuals. To address this gap in knowledge, the current study aims to investigate the co-development of

internalizing and externalizing problems in middle childhood and the moderation effect of gender and parent-child conflicts on the co-development process.

It is important to identify the patterns of co-development because these findings will potentially suggest different developmental trajectories among individuals and the leading effect of one type of problem (e.g. externalizing problems) on the other. Studies showed that children with co-occurring internalizing and externalizing problems received the highest rates of outpatient psychiatric service. In addition, individuals with co-occurring problems had more severe impairment in social relationships, academics, poorer physical and mental health compared to individuals with only internalizing or externalizing problems (Fanti & Henrich, 2010; Newman, Moffitt, Caspi & Silva, 1998). With the different co-development patterns identified (e.g. the leading effect of externalizing problems on internalizing problems or vice versa), intervention efforts customized to these patterns will be able to target the primary problem and are expected to be more effective to reduce the severity of the existing problems, prevent their development and expansion to other emotional/behavioral aspects (Miller & Hester, 1986). Longitudinal studies with repeated measures of internalizing and externalizing problems that can identify the causal or reciprocal effect between the development of internalizing and externalizing problems are needed to address this question and offer suggestions for the subsequent interventions.

1.2 - The co-development of externalizing and internalizing problems

Internalizing problems include depression, anxiety, withdrawal, fearfulness and

somatic complaints, whereas externalizing problems include aggression, defiance, destructive behavior and hyperactivity. Internalizing and externalizing problems start to develop from childhood and can lead to peer rejection, negative parent-child interactions, deviant behaviors and other maladjustment outcomes (Coie & Dodge, 1998; Keiley et al., 2003). Previous studies showed that internalizing and externalizing problems were correlated with each other (Garnefski & Diekstra, 1997; McConaughy & Achenbach, 1994). A meta-analysis on the covariance between internalizing and externalizing symptoms indicated the association between depression (an internalizing problem) and conduct disorder/oppositional defiant disorder (an externalizing problem) was as strong as that between depression and anxiety (Angold, Costello, & Erkanli, 1999).

Theories about the co-development provide explanation of the association between internalizing and externalizing problems. The "failure model" proposed by Patterson and Capaldi (1990) hypothesized that externalizing problems led to failures in social situations which further caused depression and anxiety in individuals. Several studies showed results aligned with this hypothesis—externalizing problems anteceded internalizing problems in both clinical and community samples (Boylan et al., 2007; Nock et al., 2007). It is possible that the effect of externalizing problems on internalizing problems is mediated by self-views in the way that negative social experiences associated with externalizing problems cause lower self-views which further lead to internalizing problems (Biederman et al., 1995). The interaction between individual difference in the perception of social acceptance and their true

acceptance status were also found to be related with different levels of reactive aggression (White & Kistner, 2011). These evidence suggested that negative social experience and the related change in self-views may underlie the co-development of externalizing and internalizing problems as well as the sustaining of the problems as proposed by the "failure model".

On the other hand, there are also theories and research supporting the leading effect of internalizing problems on externalizing problems. The theory of "masked depression" suggested that depression could cause acting out behaviors, as acting out provided a venue for depressed children to express their emotional feelings (Glaser, 1967). Empirical studies (Fanti et al., 2008; Ritakallio et al., 2008) also found unidirectional effect of internalizing problems (such as depression) on externalizing problems (e.g., antisocial behaviors). In the studies of children in late adolescence (Wiesner, 2003) and children who met with the clinical criterion of depression (Ollendick & Jarrett, 2009), a protective effect of depression on the later development of antisocial behaviors were found, which was opposite with what the "masked depression" theory suggested. This may be due to the fact that the effect of internalizing problems on externalizing problems can be dependent on the level of the internalizing problems and the age of the children as both depressive children and matured children should be less likely to use acting out as a way to express their distress.

Still other studies suggested a reciprocal relationship between internalizing and externalizing problems over time (Gilliom & Shaw, 2004; Keiley et al., 2000; Lee &

Stone, 2012; Measelle et al., 2006). Lee and Stone's (2012) study showed a mediational role of negative self-concept in the leading effect of externalizing problems on the later development of internalizing problems. The results regarding the co-development of internalizing and externalizing problems are mixed and warrant further investigation.

There are also measurement issues of internalizing and externalizing problems that might play a role in the findings of the co-development patterns of internalizing and externalizing problems, such as observation bias or response bias (Noordhof, Oldehinkel, & Ormel, 2009). These kinds of biases may inflate the associations found in internalizing and externalizing problems, however no method has been found that can effectively remove these biases without underestimating the association between internalizing and externalizing problems. One method used to estimate the observation bias is to extract the common factor that explains the consistency in the report across observers (e.g. parents, teachers and the children/adolescents), however this multi-trait multi-method approach has the problem of underestimating the association between internalizing and externalizing problems, as the association between internalizing and externalizing problems specific to certain environmental settings, such as homes or schools or specific to interactions between two people, such as the mother and the child will also be removed when this approach is used. One way to estimate whether the result is affected by the observer bias is to check if different co-development patterns of internalizing and externalizing problems are found from different reporters. Given that this is the case, the result may be affected

by the observation bias.

1.3 - Individual difference in the co-development of internalizing and externalizing problems

Though past studies provided evidence for the longitudinal reciprocal relationship between internalizing and externalizing problems, when it comes to the individuals, there is still a lot of variance in their developmental trajectories. Identifying these different trajectories and the personal and environmental characteristics that associate different individuals with specific trajectories will have great implication for designing more targeted and effective intervention programs dealing with these problems for certain individuals. Also, it was found that individuals with different developmental trajectories were also at different risks of developing other maladjustment problems, such as associating with deviant peers, engaging in risky behaviors (Fanti & Henrich, 2010). For example, compared with individual having only externalizing problems, individuals with co-developing internalizing and externalizing were less likely to engage in substance abuse, which suggested a protective effect of having internalizing problems on the prevention of substance abuse (Colder et al., 2013). Knowledge derived from research targeting individual difference in the co-development of internalizing and externalizing problems is valuable for developing more individualized intervention programs to reduce the two problems and other related developmental maladjustment.

However, to date only a few longitudinal studies have devoted their efforts to capturing the individual differences in the co-development trajectories, and the

antecedents as well as maladjustment outcomes associated with these different trajectories. Fanti and Henrich's study (2010) examined the developmental trajectories of internalizing and externalizing problems of children from age 2 to 12. Using latent class growth analyses, they identified eleven trajectories and found that children's gender, temperament, socio-demographic status (SDS), home environment and maternal depression predicted their membership in these different trajectory categories. Among all the trajectories identified, children with trajectories of continuous externalizing problems and continuous co-occurring internalizing and externalizing problems were more likely to engage in risky behaviors, associate with deviant peers, receive more peer rejection and become more asocial with peers in early adolescence. Another study examined the co-development of internalizing and externalizing symptoms from middle to late childhood and the effects of gender and the function of psychophysical stress response system on the co-development patterns (Hinnant & El-Sheikh, 2013). Latent mixture growth modeling was used and three co-development profiles were identified. The main effect of psychophysical stress response system function (indicated by baseline and task-related respiratory sinus arrhythmia) and an interaction between psychophysical stress response system function and gender were found to predict different co-development trajectories.

In another longitudinal study of the reciprocal relationship of internalizing and externalizing problems (Lee & Stone, 2012), gender difference was also found in the stability of internalizing and externalizing problems and the concurrent correlation between internalizing and externalizing problems. Boys showed more stability in

externalizing problems while girls showed more stability in internalizing problems. The cross-sectional correlation between internalizing and externalizing problems was also found to be higher for boys. These studies together suggest that boys and girls follow different trajectories regarding the co-development of internalizing and externalizing problems and that gender is likely to be a moderator of the reciprocal relationship between internalizing and externalizing problems over time. In the current study, the moderation effect of gender on the co-development patterns of internalizing and externalizing problems during middle childhood will be investigated.

Another potential moderator of the co-development is children's social experience with others. Empirical evidence suggested that parent-child conflicts appeared to play an important role in the co-development process as it could increase the cross association between internalizing and externalizing problems. For example, it is found that children with internalizing/externalizing problems who also perceived their parents as more rejecting were more likely to develop problems in the other domain compared with those who didn't experience negative parenting (Hale, Vandervalk, Akse & Meeus, 2008). Also, parent-child relationship quality seemed to be associated with the levels of internalizing and externalizing problems as well. In a recent study of Korean early adolescents, Lee & Bukowski (2012) found that parental attachment measured at the beginning of the study had significant associations with both internalizing and externalizing problems obtained in the initial assessment and the three following annual assessments. From a theoretical perspective, children who

have more negative social experience with their parents are more likely to develop both externalizing and internalizing problems, because their externalizing problems are more likely to lead to internalizing problems (e.g. depression) when they encountered more conflict and rejection in social interactions with their parents as suggested by the "failure model". In the current study, this hypothesis about the moderation effect of parent-child conflicts on the co-development of internalizing and externalizing problems will be tested in a longitudinal design.

1.4 - Methods to test co-development of internalizing and externalizing problems

Methodologically, studies of individual difference in the co-development of internalizing and externalizing problems either focused on identifying different trajectories or applied cross lagged panel models to study the reciprocal relationship. Though identifying different trajectory groups is very helpful in describing the co-development trends of internalizing and externalizing problems, there are also problems with this approach. One problem is the approach is exploratory in nature; often times different numbers of latent groups are identified across studies depending on the specific study designs and the measures used, and the interpretation of these groups are sometimes arbitrary (Jung & Wickerama, 2008). Another problem is that metric invariance of the construct (i.e. equivalence of factor structure and loadings on the corresponding observed items) across different measurement occasions is not examined before the latent category analysis and this causes difficulty of comparison among values of the same variable (e.g. internalizing problems) measured at different ages as they might not be measured in the same way across time (Meredith & Horn,

2001).

There is also problem with the cross-lagged analysis used to examine the reciprocal relationship between internalizing and externalizing problems. A prerequisite for the use of cross-lagged analysis to detect the effect of one variable on the change of another variable is that the equality of variance and covariance of factors holds over time, but often times this requirement for equilibrium was not examined and thus led the accuracy of the estimated effects open to question (Browne & Nesselroade, 2005). Another problem with the cross-lagged analysis approach is that this modeling approach examines change relative to the group rather than relative to the individual and it is hard to model alternative forms of growth (e.g. quadratic) other than the linear growth (Lee & Bukowski, 2012).

To address the limitation of previous methods in studying the co-development patterns, two modern modeling approaches: longitudinal growth models (LGM) and longitudinal difference score models (LDS) will be used to examine the reciprocal relationship between internalizing and externalizing problems across four measurement occasions with one year interval between (from the third to the sixth grades). Comparison between the modeling results from the two approaches will be made to show their effectiveness in testing the co-development patterns over time. Study Question 1 will address whether the two approaches yield similar or different results, and why.

LGM and LDS are two popular modeling approaches for the testing of developmental change over time (Meredith & Tisak, 1990; McArdle, 2009). By

specifying the growth model, the hypothesis about the growth trajectories and the association between the two trajectories can be tested directly by these two approaches. Bivariate LGM and LDS analyses share some similarity for the modeling of change, as both models estimate the intercepts and the slopes of the two constructs measured across multiple occasions as well as the cross-over correlations between the intercepts and slopes for the two constructs over time. Both of these two models allow direct tests of the change associations between internalizing and externalizing problems and various forms of change (e.g. linear, quadratic) can be specified and tested. Both models allow for the test of directional effect of one construct on the change of another construct, various co-development patterns can be revealed by these estimated effects.

Besides the similarity, bivariate LGM (Figure 1) and LDS (Figure 2) models of the development of internalizing and externalizing problems differ in the way the growth models are specified and co-development patterns are tested. For the specification of the growth model, LGM requires a hypothesis about the trajectories of time-varying constructs, either in the linear, quadratic or other mixed forms so that the intercept, slope factors as well as their loadings on the construct at each assessment can be specified. After these specifications, the hypothesized model can be tested with the data and the model fit can be used as a criterion to see if the hypothesis about the growth trajectories is supported. In LGM, the loadings of the slopes (λ_2-λ_4, α_2-α_4 in Figure 1) reflect how the constructs vary with time. The co-development pattern is estimated through the cross-correlations between the intercept and slope

factor scores of the two constructs (γ_1, γ_2, β_4 in Figure 1). These estimates from LGM provide an overall estimate of the association between the initial level of one construct (i.e. the intercept factor) and the general growth pattern of the other construct (i.e. the slope factor) rather than an estimate of the effect that is time specific. Or in other words, it does not provide an estimate of predictive effect of one construct on the change of the other construct at each time or developmental stage. As a result, LGM is adequate for estimation of the co-development pattern when the growth trajectory can be well captured by the slope factor and the association between the intercept of one construct and the slope factor of the other factor is linear. Otherwise, LGM will not be very effective in testing the co-development patterns of two associated constructs.

LDS estimates the change score between two adjacent time points directly. The change score is represented as a latent variable in the model (Δint3-5, Δext3-5 in Figure 2). This latent change score is composed of three parts: a proportional auto-regression effect ($\beta_{int,}$ and β_{ext} in Figure 2) of the construct measured at the previous time point, a proportional change part that reflects the cross-effect (γ_{int}, γ_{ext} in Figure 2) of the previous level of the other construct on the change score and a systematic change part that holds the same across time, which is captured by equal loadings (α_{int}, α_{ext} in Figure 2) on the slope factor that describes the common trends of change across time. Compared with LGM, LDS provides more specific and detailed information about the change effects over time and the possibility to model time-varying change effects if the three predictive paths just mentioned don't hold

equal across time. This can be done by specifying the parameters listed above to be unequal over time and to check if the model fit improves upon those changes. However, on the other side, this also results in more effects that need to be estimated, making the model more complicated, and sometimes the complexity of the model make it hard to get a good fit or even a converged result.

Using these two modeling approaches, the current study will investigate the co-development patterns of internalizing and externalizing problems during middle childhood as well as the moderation effect of one time-invariant moderator—gender and the moderation effect of one time-variant moderator—parent-child conflicts on the co-development of the two types of problems. Comparisons will be made between the two modeling approaches from the aspects of model fit, estimates of the co-development and detection of the moderation effects.

Another issue the current study plans to tackle is measurement invariance of the same constructs over time. Time-invariance of the repeated constructs is a prerequisite for the test of change of a construct over a certain period of time during development. However, in reality, this prerequisite is often ignored by researchers who examine the longitudinal change or the test is done but the result suggests time invariance of the construct is not met (e.g. the loadings of the construct on the same items are not equivalent across different measurement occasions). In the proposed study, as the first step, the time-invariance of internalizing and externalizing problems will be tested by placing equivalence constraints of the loadings of the two latent constructs on the correspondent items over time. For the test of time-invariance of the measurement of

internalizing and externalizing problems, separate tests will be carried out for boys and girls as well as groups with different parent-child conflicts level to investigate if time-invariance of the measurement holds in each of these groups. If the time-invariant feature of the measures is not met, datasets that meet the time-invariant prerequisite will be simulated, and both the real dataset and the simulated dataset will be put into tests of the proposed longitudinal reciprocal relationship using LGM and LDS approaches. The results from the two datasets will be compared, and the robustness of these two approaches to the violation of the time-invariant metric prerequisite will be discussed.

1.5 - Informant Differences

In addition, the current study used mothers' and fathers' reports separately to test the co-development patterns between internalizing and externalizing problems. Past studies showed only moderate correspondence between mothers' and fathers' reports of children's internalizing and externalizing problems (Duhig, Renk, Epstein, & Phares, 2000). This moderate correspondence suggests that mothers and fathers provide at least some unique information regarding the development of their children's internalizing and externalizing problems. The discrepancy may lie in the fact that mothers and fathers interact differently with their children and have different tolerance and perceptions of their children's internalizing and externalizing problems (De Los Reyes & Kazdin, 2005). Nevertheless, in most studies only mothers were included as primary informants on children's behaviors while fathers were relatively neglected in research (Treutler & Epkins, 2003).

To address this gap in knowledge, the current study will address Study Question 2: whether results are similar or different for different raters. The dataset includes both mothers' and fathers' reports on children's internalizing and externalizing problems. These two different sources of information will provide a more comprehensive view regarding the co-development patterns and provide the opportunity to examine the consistency or discrepancy in findings based on mothers' and fathers' reports and the possibility that observer bias may affect the findings of the current study.

1.6 - The current study

To add knowledge of the co-development patterns and to resolve the inconsistency in previous study findings, the current study plans to investigate the co-development of internalizing and externalizing problems during middle childhood, a period characterized by increasing co-occurrence of those two kinds of problems (Oland & Shaw, 2005).

Based on previous studies and theories, the study has the following hypotheses:

1. Girls and boys will have different developmental trajectories of internalizing and externalizing problems. Boys will have more externalizing problems while girls will have more internalizing problems. For the cross-association over time, externalizing problems in girls will be more likely to lead to internalizing problems because culturally externalizing problems are expected to be less acceptable for girls and thus are more likely to induce negative social experience with others and negative emotional feelings as predicted by the failure model. For boys, consistent with the "masked depression" theory, internalizing problems may have a stronger effect on

externalizing problems as boys are more likely to use acting out as a way to express their emotional distress. In the current study, a protective effect of internalizing problems on the development of externalizing problems is not expected because the age of the study participants are relatively young (only middle-childhood) and the study is based on a community sample.

2. Parent-child conflict levels will moderate the co-development patterns of internalizing and externalizing problems. Children who have constantly or increasingly more conflicts with their parents over time are expected to show stronger cross-lagged associations between internalizing and externalizing problems, compared to children with low levels of parent-child conflict. This is because for children who experience more parent-child conflicts, their externalizing problems are more likely to lead to internalizing problems (e.g. depression) as they encounter more conflict and rejection in social interactions with their parents.

Since moderator effects of gender and parent-child conflicts are hypothesized in the current study, the LGM and LDS models with the whole sample won't be run in the first place, as paths in the models are presumed to be different across different gender or parent-child conflict groups. In the case that the hypothesized moderation effects of both gender and parent-child conflicts are not supported, additional analysis of the general co-varying patterns of internalizing and externalizing problems will be run using the whole sample.

The study also addressed two major exploratory questions.

Study Question 1. Will LGM and LDS models yield the same, or distinct patterns

of results—and if different, what might be the major explanation and implication of the differences?

Study Question 2: Will results be similar or different for mothers' and fathers' ratings—and if different, what might be the major explanation and implication of the differences?

Chapter 2 - METHOD

2.1 - Sample

Empirical tests of the proposed reciprocal relationship and the moderation effects were conducted using the Study of Early Childhood Care and Youth Development (SECCYD) sample during the third phase of the study (2000-2004). The sample in the SECCYD study includes 1007 children and their families from 9 states in the United States (Arkansas, California, Kansas, New Hampshire, North Carolina, Pennsylvania, Virginia, Washington, and Wisconsin). The proposed analyses used the demographic information collected when children were 1 month of age, mothers' and fathers' reports of their children's internalizing and externalizing problems from the third grades through the sixth grades. Children's race was 80% White, 13% African American, 2% Asian, and 5% other. When children were 1 month of age, the mothers' age were 28 years old on average (*SD* = 5.63; range = 18 - 46). Parents' highest education level was (for mother/father): 31/31% high school or less, 33/30% some college, 21/22% bachelor's degree, and 15/18% postgraduate education or degree. 15% of the families had an annual family income lower than 10000USD, 28% between 10000 and 25000, 34% between 25000 and 50000, 18% between 50000 and 100000, and 5% higher than 100000. 86% of the parents were married or living together.

2.2 - Measures

Internalizing and externalizing problems. Internalizing and externalizing problems were measured by fathers' and mothers' reports on Child Behavior Checklist (CBCL, Achenbach, 1991, 1992). Internalizing problems include somatic complaints,

anxiety and depression and withdrawn; externalizing problems include delinquent behaviors and aggression. The measures are available from third to sixth grades. The reliability (i.e. alpha coefficient) for internalizing problems ranged from .65 to .73 and the reliability for externalizing problems ranged from .75 to .80. The mean of the externalizing problems from Grade 3 to Grade 6 ranged from 6.19 to 7.33 and the mean of internalizing problems ranged from 4.87 to 5.14. The subscale scores of internalizing and externalizing problems were skewed. The two normality tests used in SPSS (Kolmogorov–Smirnov test and Shapiro-Wilk test) both showed significant results. In the following LGM and LDS analyses, Maximum Likelihood with Robust Error (MLR) was used as the estimator, as this estimator provides robust analysis result to skewed data.

Gender. Children's gender was based on mothers' reports on the demographic information collected at the start of the study. A dummy variable is used to represent gender in the subsequent analyses (0=boy, 1=girl).

Parent-child conflict. Parent-child conflict was measured by the conflict subscale of Child-Parent Relationship Scale (Short Form, Pianta, 1995). An example item is "My child and I always seem to be struggling with each other". Both fathers' and mothers' reports on this subscale were available from the third to the sixth grades. The reliability of the conflict (alpha coefficient) subscale ranged from .78 to .84. The means of the conflicts from the third to the sixth grades ranged from 14.23 to 16.52. Parent-child conflicts scores were also skewed, as the two normality tests used in SPSS (Kolmogorov–Smirnov test and Shapiro-Wilk test) both showed significant

results, so the MLR estimator was also used in the subsequent latent class growth analysis to get robust estimates of the growth trajectories.

2.3 - Missing data

Given that the current study involved four times of assessment, for a small number of cases full reports across the four time points were not available. Analyses of missing data patterns were conducted and the result showed that for mothers' reports on child internalizing and externalizing problems, Little's (1988) Missing Completely at Random (MCAR) tests showed all nonsignificant results, indicating that those missing data across waves were random and hence the analyses based on cases with complete data should not bias the estimates (Table 13). No change was made to mothers' data before the analyses. As the default of Mplus program, FIML (Full information maximum likelihood) was used in the LGM and LDS analyses. For fathers' reports, MCAR tests were not significant for internalizing problems but significant for the reports on externalizing problem subscales from Grade 3 to Grade 6 (Table 14). Paired T-tests showed that those retained in the study showed marginally significant lower aggression in Grade 3 (t=*-1.7*, p=*.09*) and significant lower aggression (t=*-3.3*, p=*.001*) in Grade 4 compared with those who dropped out. The delinquency level in Grade 4 was also significantly lower for those who retained in the study (t=*-2.3*, p=*.03*). For missing values on fathers' reports of externalizing problems, multiple imputations were applied in SPSS and missing values were imputed based on the association between the missing status and previous level of the problems estimated by the program. This approach retained the variety of the sample

and the power of the test and was deemed as appropriate for the case of non-random missing (Schafer & Graham, 2002). The dataset with imputed data on the missing values of aggression and delinquency was used in the following analyses.

2.4 - Plan of analyses

The analysis plan incorporated preliminary analyses to set the stage for analyses of the study hypotheses and questions.

Preliminary Analyses I: Latent class growth analysis of parent-child conflicts. To test the moderation effect of the time-varying moderator of parent-child conflict for Hypothesis 3, first a latent class growth analysis was done on parent-child conflicts to capture the different trajectories of parent-child conflicts over time (Nagin, 1999). This analysis is exploratory in nature. Models with different numbers of latent classes will be compared based on two fit statistics: Bayesian information criterion (BIC) and the Lo, Mendel, Rubin (LMR) statistic. The model with lowest BIC and a non-significant LMR statistic compared to models with more classes will be chosen as the final model. An insignificant LMR statistic indicated that the model with fewer classes fit the data no worse than that with more classes. The Class memberships obtained in the final model will be used in the further analysis as the moderator of parent-child conflicts. Latent class growth analyses for parent-child conflicts will be done separately for mothers and fathers to capture the latent groups with different trajectories of mother-child conflicts and father-child conflicts. The latent class growth analysis is used to capture parent-child conflicts so groups with different conflict trajectories can be tested in the primary analysis to see if the co-development

patterns of internalizing and externalizing problems differ among these groups. Although it has been mentioned before that latent class analysis was exploratory in nature, it is less a problem when this approach is used together with other analysis method and other variables that can provide external validity of the extracted classes. In the current study, this approach is used together with the LGM and LDS analysis of the co-development patterns. The LGM and LDS will also provide external validity information to the classes extracted if the analyses show that groups with different parent-child conflict trajectories have different co-development patterns of internalizing and externalizing problems. In the current study, the latent class growth analysis also provides a way to examine the moderation effect of a time-variant variable—parent-child conflicts by extracting different latent classes according to the trajectory of the variable across time.

Preliminary analyses II: Tests of the time-invariance of measurements. Also prior to substantive analyses and as mentioned before, the time invariance of the measurement of internalizing and externalizing problems from the third to the sixth grades must be tested first. Construal invariance hypothesis (equivalent loadings of the subscale scores on the latent factors across time) and strong invariance (equivalent loadings of the subscale scores on latent factors over time and equivalence of the intercepts of subscale scores across time) are tested for mothers' report and fathers' report separately (Meredith, 1993). If there is no significant difference in the model fit between the construal invariance model and the model where equivalence of loadings is not assumed, then construal invariance holds for the repeated measures. If the

construal invariance holds, further test that compares it with the strong invariance model will be conducted. If no significant difference in model fit between the two models is detected, strong invariance of the constructs holds over time. If the factor loadings of the latent internalizing and externalizing factors on the correspondent subscale scores vary across time, and the time-invariance of measurement doesn't hold, a dataset with time-invariant internalizing and externalizing variables will be simulated and the same set of tests of the hypotheses will be performed using both the real and the simulated datasets. The model fit, the estimated effects of the co-development patterns and the moderation effects of gender and parent-child conflicts will be compared between the these two datasets. Based on the comparison, the influence of time-varying measurement on longitudinal studies of change will be discussed. Factor scores of internalizing and externalizing problems from the factor analyses instead of the raw scores will be used in LGM and LDS models of the co-development patterns.

Study Hypotheses and Questions: Testing the longitudinal reciprocal relationship between internalizing and externalizing problems.

Following the preliminary analyses, the substantive analyses to test hypotheses and address study questions will be conducted. Bivariate LGM and LDS (Figure 1 and Figure 2) model will be fit separately to test the two hypotheses and address the two major study questions. To test the moderation effect of gender (Hypothesis 1), LGM and LDS models for both gender groups will be fit separately, first without restrictions of equivalence of the corresponding path coefficients estimated in the models across

gender. Then one at a time, the equivalence constraints will be imposed on each path coefficient across gender groups. Chi-square difference tests will be conducted to compare the model fit among these nested models to examine the moderation effect of gender. If restricting certain path coefficients to be equal across boys and girls produces significantly poorer model fit, a moderation effect of gender on this specific path is identified.

For the test of the moderation effect of parent-child conflict (Hypothesis 2), after the groups with different trajectories of parent-child conflicts are identified, separate LGM and LDS models will be fit within each group identified first without equal constraints of path coefficients across groups. Then the equivalence constraints of coefficients will be imposed among groups of children with different parent-child conflict trajectories. Similar to the test of the moderation effect of gender, chi-square difference tests of these nested models will be compared to examine the moderation effect of parent-child conflicts. If restricting certain path coefficients to be equal across children with different trajectories produces poorer model fit, a moderation effect of parent-child conflicts on this specific path is identified.

For the specification of the slope factor loadings in LGM (Figure 1), both linear hypothesis about the trajectories (λ_2=1, λ_3=2, λ_4=3, α_2=1, α_3=2, α_4=3) and the alternative model with freely estimated slope factor loadings at Grade 5 and Grade 6 will be tested and comparisons will be made between those model fits to choose an optimal model that more closely reflect the developing trajectories of internalizing and externalizing problems. If the model fit prefers non-linear trajectory over linear,

model fit between the models with one freely estimated slope loading factor (λ_4, α_4) and with two freely estimated slope loading will be further compared in order to pick the model that adequately describes trajectory with the most simplicity. If the model with one freely estimated slope factor for internalizing or externalizing problems doesn't fit significantly worse than the model with two freely estimated slope parameters for each form of the problem, the less complicated model will be chosen as the final model.

Regarding the specification of the parameters in LDS (Figure 2), for simplicity purposes, equal proportional increasing effects (β_{int}, β_{ext} in Figure 2) and cross-directional effects (γ_{int}, γ_{ext} in Figure 2) will be hypothesized first and are subject to change if the model fit suggests unequal effects across time. Similarly, the loadings from the slope factors (α_{int}, α_{ext} in Figure 2) to the change scores will be fixed at 1 to represent consistent change with time.

For Study Question 1, comparisons will be made among LGM and LDS models regarding the model fit, parameter estimates, consistency/inconsistency in conclusions about the co-development patterns, and the testing of the moderation effects of gender and parent-child conflicts. For Study Question 2, LGM and LDS models of the hypothesized co-development patterns will be run using mothers' and fathers' report separately, the findings based on one informant will be compared to the findings based on the other informant to detect if there is any informant difference in the co-development of internalizing and externalizing problems.

Chapter 3 - Results

3.1 - Descriptive and correlational results

The descriptive and correlational results were presented in table 1 through table 12. Generally, mothers' and mothers' ratings on child internalizing and externalizing problems were moderately correlated across all waves (.16-.55). Within each wave, internalizing and externalizing problems were significantly correlated. Internalizing and externalizing problems were correlated with parent-child conflicts, the more problems children had, the more severe the parent-child conflicts became. Internalizing and externalizing problems also showed stability over time. And both the ratings of internalizing and externalizing problems were skewed.

3.2 - Preliminary Analysis 1: Latent classes of parent-child conflicts growth trajectories

To identify the numbers of trajectories for parent-child conflicts, two to six classes models were estimated using latent class growth analyses for mothers' reports and fathers' reports. The result showed that the five-class linear growth model for mothers' report and three-class linear growth model for fathers' report, had the lowest BIC and the LMR tests between these final models with models of one more class were non-significant (Table 15). For mothers' reports, five trajectories were found, including a continuously low conflict trajectory group, a continuously moderate conflict trajectory group, a moderate to low conflict trajectory group, a low to moderate conflict trajectory group and a continuously high conflict trajectory group. For fathers' reports, three trajectories were revealed, including a continuously high

conflict trajectory group, a continuously low conflict trajectory group and a low to high conflict trajectory group. Separate LGM and LDS models were fit to each trajectory group in the subsequent analyses to test the moderation effect of parent-child conflicts on the co-development of internalizing and externalizing problems.

3.3 - Preliminary Analysis 2: Time-invariance of the measurement

Tests of time-invariance of the measurement of internalizing and externalizing problems showed that strong invariance held for both boys and girls for both mothers' and fathers' reports (Table 21). For each parent-child conflict trajectory group, strong invariance of the measurement also held for both mothers' and fathers' report (Table 22). As a result, simulation of datasets with time-invariant measurements was not necessary and the factor scores from the time-invariant analyses were used in the following LGM and LDS modeling of the co-development patterns.

3.4 - LGM and LDS analyses of the co-development patterns

Next, the results of analyses for the two Study Hypotheses are described. The analyses that were conducted directly or indirectly addressed the two major Study Questions. Therefore, there are not separate sections below for Questions 1 and 2. However, those two questions are addressed fully in the Discussion.

Hypothesis 1: Gender as a moderator. The LGM modeling of the co-development of internalizing and externalizing problems showed similar results from mothers' and fathers' reports. The LGM model estimates were shown in Figure 3. The estimates for girls were listed after the estimates for boys separated by "/".

Results based on fathers' reports were presented in the parentheses. Significant path estimates were presented in bold characters. Path estimates that were different across gender were presented in italics. Generally, for both boys and girls, the initial levels of internalizing or externalizing problems associated negatively with change in the problem themselves and the other type of problem. The associations between the initial levels of internalizing and externalizing problems and the association between the slopes of the two problems were both positive. Externalizing problems showed significant decrease over time for both boys and girls, while the slopes of internalizing problems were not significant for both gender. For both mothers' and fathers' reports, boys and girls didn't differ significantly from each other on most of the growth path estimates, with the exceptions of the initial level associations between internalizing and externalizing problems of mothers' reports and the slope associations of fathers' report. For mothers' reports, the association between initial levels of internalizing problems and externalizing problems was stronger for girls than that for boys. For fathers' reports, the association between the slopes of internalizing and externalizing problems was stronger for boys than that for girls.

The estimates for the moderation effect of gender on the co-development patterns in the LDS model were presented in Table 16. The association between the initial levels of internalizing and externalizing problems and the association between the slopes of internalizing and externalizing problems were positive for both internalizing and externalizing problems. The cross-associations between the initial level of internalizing problems and the slope of externalizing problems and that between the

initial level of externalizing problems and the slope of internalizing problems were also positive. However, the association between scores at each assessment and the subsequent change scores were negative for both internalizing and externalizing problems. Consistent with the LGM results, LDS model also showed that externalizing problems kept decreasing during middle childhood for both boys and girls.

The moderation effect of gender on co-development of symptoms was more often detected from mothers' reports. For mothers' reports, the association between internalizing and externalizing problems at the initial assessment was stronger in girls (Table 24). This was also consistent with findings from LGM approach. The association between the initial level of internalizing problems and the slope of externalizing problems and the associations between the slopes of internalizing and externalizing problems were also stronger for girls. For the path estimates of the co-development pattern, consistent with hypothesis 2, boys' internalizing problems lead to later increase in externalizing problems, while the predictive effect of internalizing problems on the change of externalizing problems was not significant for girls. However, this hypothesis was not supported by fathers' reports. For fathers' reports, girls showed more rapid decreasing of externalizing problems than boys and for both boys and girls, externalizing problems predicted later increase in internalizing problems. Consistent with hypothesis 2, the predictive effect of externalizing problems on the increase of internalizing problems was slightly bigger in girls but the difference across gender was not statistically significant.

Hypothesis 2: Parent-child conflict as a moderator. LGM results (Table 17) for different trajectory groups of mother-child conflicts showed that there was very little variance across individuals in the initial levels and slopes of internalizing and externalizing problems for individuals in "low conflicts", "moderate conflicts" and "high conflicts" groups. As a result, in those groups the variance of the intercepts and slopes were fixed at 0 for model fit purpose. For the same reason, the variance of the intercepts of the "low to moderate conflicts" group and the variance of the slopes of the "moderate to low conflicts" group were also fixed at 0. For mothers' reports, the "low" and "high" conflicts group showed significant decreasing in externalizing problems over time, while no increasing or decreasing trends of internalizing and externalizing problems were detected in other three trajectory groups. For groups whose variance of intercepts and slopes are not fixed at 0, the association between the initial levels of internalizing and externalizing problems (moderate to low conflicts group) and the association between the slopes of internalizing and externalizing problems (low to moderate conflicts) were positive and significant.

The decreasing trends of externalizing problems were not found from fathers' reports (Table 23). For the low father-child conflict group, the internalizing problems decreased over time, while the opposite is true for the "low to high father-child conflict" group. Externalizing problems also increased over time for the "low to high father-child conflict" group. The initial levels of internalizing and externalizing problems were positively associated for all the groups. The same was true for the association between slopes of internalizing and externalizing problems except for the

"low to high father-child conflicts" group, and for this group there was little variance in the slopes and the variance of the slopes was fixed at 0 for model fit purpose. For the high conflict groups, the initial levels of internalizing and externalizing problems associated negatively with their own slopes as well as the slope of the other type of problem.

LDS results (Table 25) showed negative association between the proportional change in internalizing/externalizing problems and the previous level of internalizing/externalizing problems. For mothers' reports, the level of internalizing/externalizing problem at a previous time didn't predict later change in the other problem. Compared to other groups, the "low mother-child conflicts" and "high mother-child conflicts" conflicts groups showed decreasing trends of externalizing problems.

For fathers' reports, internalizing problems positively predicted later change in externalizing problems regardless of the father-child conflict level reported (Table 25). Consistent with hypothesis 3, the predictive effect of externalizing problems on the change of internalizing problems was greater in "high father-child conflicts" group than the other two groups. Also consistent with results from the LGM, the initial levels of internalizing and externalizing problems associated positively for all groups, and an overall increasing trend in internalizing and externalizing problems was detected in the "low to high conflicts" group.

Chapter 4 - Discussion

Using a nationally representative sample, the current study showed that during middle childhood the development of internalizing and externalizing problems were intertwined. The co-development patterns of internalizing and externalizing problems differed for boys and girls. In addition, different co-development patterns were also discovered for children with different trajectories of parent-child conflicts during middle childhood.

4.1 - Co-development of internalizing and externalizing problems during middle childhood

The current study found that the association between internalizing and externalizing problems during middle childhood was not only concurrent but also cross-directional over time. The changes of each form of problem behavior were associated with changes in the other form of problem behavior, as indicated by the correlated slope factors from the LGM and LDS analyses. Changes in one problem were closely related to changes in the other problem and those changes were in the same direction. This co-development pattern was reflected in the positive correlations between the slope factors estimated using the LGM approach and more explicitly by the positive predictive effect of externalizing problems on the change in internalizing problems using the LDS approach.

The fact that both methods discovered the co-development effect showed that the associations between internalizing and externalizing problems existed at different levels of temporal specificity. First, the LGM results indicated that the association

existed on an overall trajectory level when estimated using all time points in the study. Children with higher initial levels of each form of problem behavior showed greater decreases in the other form of problem behavior over time, and changes in the two forms of problem behaviors were in the same direction over time. This replicates results from Keiley et al. (2003)'s study of children from kindergarten to Grade 7, in which they also found a positive association between the slopes of internalizing and externalizing problems. The same co-development pattern of internalizing and externalizing problems (i.e. positive association between the two slopes) was also found in a study of Korean early adolescents (Lee & Bukowski, 2012).

Second, the LDS results showed that the association existed at specific lagged time points. At each time of assessment, the change in internalizing problems depended partly on the previous levels of internalizing and externalizing problems, and the proportional changes remained constant over time. Thus, the separate temporal parts of the changes of internalizing and externalizing problems were positively associated with each other. The initial levels of internalizing problems and the initial level of externalizing problems were both positively associated with changes in the other problem type over time. To my knowledge, no prior study has estimated this model using LDS, making the findings for the LDS model unique to the literature.

The findings of the co-development patterns suggest that when studying the trajectories of internalizing or externalizing problems during middle childhood it is necessary to take into account the levels of both forms of problem behavior

simultaneously, because each form of problem predicted changes in the other form over time (Lilienfeld, 2003). Also, the associations between the broad internalizing and externalizing problem syndromes examined in the current study were different from the associations found between specific internalizing (e.g. depression) and externalizing problems shown in prior studies (Measelle et al., 2006). In their study, they found initial levels of depressive symptoms and antisocial behaviors predicted later increase in each other. This would seem to indicate that studies like the current one that examine co-development of broad internalizing and externalizing problem syndromes can offer unique and valuable additional information beyond what may be found when examining narrower facets of these two problems. Such analyses have the unique potential of offering insights in improving the overall adjustment of children, beyond implications for the treatment of specific disorders (Boylan et al., 2007).

4.2 - Hypothesis 1: The moderation effect of gender on the co-development pattern

The first study hypothesis was that boys and girls would show different developmental trajectories of internalizing and externalizing problems. Moderation effects of gender on the co-development patterns were not discovered from the LGM analysis except for a greater association between internalizing and externalizing problems for girls at Grade 3, and this gender difference only existed for mothers' reports. Similar gender effects on the correlations of the initial levels were found in the LDS analysis using mothers' reports.

Although not much gender difference in the co-development patterns of the

overall trajectories was detected, a few gender effects were revealed from the LDS analysis where the changes were broken down to several parts. First, consistent with hypothesis 2, internalizing problems in boys at previous time points led to increases in externalizing problems later, but showed no such effect in girls. The associations between the development of internalizing and externalizing problems as suggested by the "masked depression" theory was found in boys. The finding indicates that interventions on improving emotion regulation and expression are important for boys with internalizing problems as these interventions may prevent the "overspread" effect of internalizing problems to externalizing problems. On the other hand, if left unattended, the internalizing problems can lead to development in externalizing problems, over time the increase in externalizing problems combined with the existing internalizing problems can put these boys at greater risks of engaging in risky behaviors, associating with deviant peers and experiencing more peer rejection (Fanti & Henrich, 2010). This gender effect only exists in mothers' reports.

From fathers' reports, a proportional increase in internalizing problems driven by previous levels of externalizing problems is discovered. This finding was consistent with the "social failure" theory, which suggests negative social experience induced by externalizing problems will lead to the development of subsequent internalizing problems. This effect was slightly greater in girls and the difference across gender was not significant. The reason that the gender difference detected in this proportional change effect is smaller than expected may be that during middle childhood the gender-differential socialization has just started and pressures to behave in

gender-appropriate ways are not as strong as that during adolescence (Hill & Lynch, 1983; Huston & Alvarez, 1990). Related studies on gender difference of depression also showed that the difference emerged in mid-adolescence (Nolen-Hoeksema & Girgus, 1994). Future studies with older participants are needed to test this possibility. Another reason why the expected gender difference in the cross-lagged association between externalizing and internalizing problems was not found in the current study may be that parents' reports were used in the study. Children may not behave in a way consistent with their gender role in the family settings as much as in the school settings. Gender segregation in schools and the fact that children's behaviors are open to the observation of others (including other children and the teacher) may make them more likely to behave in a way consistent with their gender role and make the difference between boys and girls more obvious to observers like teachers (Maccoby & Jacklin, 1987; Maccoby, 1990). Consistent with this reason, one study that included both mothers' and teachers' reports of children's internalizing and externalizing problems showed that gender difference in the trajectories of these two problem were more often detected when teachers' reports were used (Keiley et al., 2003).

Previous levels of internalizing problems predicted proportional decrease in internalizing problems for both gender, but the effect was greater for girls based on mothers' reports. In previous studies of the trajectories of internalizing problems during childhood, it was also found that for the majority of boys and girls, the development of internalizing problems followed a decreasing trajectory over time (Hinnant & El-Sheikh, 2013; Sterba, Prinstein, & Cox, 2007). It seems that girls with

purely internalizing problems will grow out of it or at least have fewer problems later during middle childhood. The trend found in middle childhood is different from the findings in adolescence or later stages of development, which more often found a stable and increasing trend of internalizing problems in girls (Scaramella, Conger, & Simons, 1999).

From the LDS analysis, the systematic changes in externalizing and internalizing problems were more strongly associated for girls based on mothers' reports, and the same was true for the association between the initial levels of internalizing problems and the systematic change of externalizing problems. This suggests that for girls, the cross-associations between the systematic changes of internalizing and externalizing problems are stronger during middle childhood than that for boys.

Across gender there was a systematic decreasing trend in externalizing problems, and this trend was stronger for girls based on fathers' reports. As the systematic change represent consistent linear change over time without considering the previous level of the problems, this finding indicates that during middle childhood girls' externalizing problems decrease more rapidly with time than boys. Similarly, a previous study also showed similar decreasing linear trend of externalizing problems during childhood (Keiley et al., 2003). In that study, girls also showed rapid decreasing trend but the gender difference was not statistically significant. This suggests that girls are less likely to develop externalizing problems than boys during middle childhood.

Overall, the study findings supported the hypothesis that girls and boys differed in

the co-development patterns of internalizing and externalizing problems during middle childhood. For boys, internalizing problems can induce later increase of externalizing problems and this suggests more effort needs to be made to effectively identify internalizing problems at an early stage in boys in order to prevent the cross-over effect. Also necessary are interventions that teach boys to interpret and express their feelings appropriately.

4.3 - Hypothesis 2: The moderation effect of parent-child conflicts on the co-development pattern

The second study hypothesis was that Parent-child conflict levels would moderate the co-development patterns of internalizing and externalizing problems. The results of the LDS and LGM analyses showed that children who had different trajectories of parent-child conflicts also had different developmental patterns of internalizing and externalizing problems.

First, both LDS and LGM analyses indicated that children with increasing levels father-child conflicts showed increasing trends in both internalizing and externalizing problems through middle childhood, and no similar trends were detected for children with either continuously low or high conflicts with their fathers. Consistent with the current study, previous studies on the effect of parenting on children's development also showed significant predictive effect of fathers' negativity on children's depression and antisocial behaviors, but similar effects were not found on mothers' negativity. Instead, the presence of maternal support showed a protective effect against fathers' negativity (Elder, Conger, Foster, & Ardelt, 1992). For children who

had low level of conflicts with their fathers, a linear decreasing trend in externalizing problems was detected. A marginally significant linear decreasing trend in internalizing problems was also found for children with low level of conflict with their fathers, but this effect only existed in the LGM analysis. The fact that the increasing trends in externalizing problems echoed the increasing trend in father-child conflicts implicates that a transactional process may exist between children's externalizing problems and their conflicts with their fathers. Consistent with this implication, in a study of adolescents, it is also found that increasing in adolescents' externalizing problems predicted decreasing of their relationship quality with their fathers (Fanti et al., 2008). The close association between the two increasing trajectories indicates the important role that fathers play in the development of their children's externalizing problems. It is necessary to involve fathers and improve father-child relationship quality to alter the increasing trend in externalizing problems for this group of children, as non-reactive fathering to child behavioral problems can not only break the cycle of the coercive interactions between fathers and the children but also stop the escalation of the children's externalizing problems.

Also, from the LDS analyses, it is found that the change in internalizing problems was positively predicted by the previous level of externalizing problems. For children with increasing trajectory of father-child conflicts or continuously high father-child conflicts, the effect was greater, though not significantly different from the effect for children with low level of father-child conflicts. It might be that the sample size in the "low to high conflicts" and "high conflicts" groups was relatively small and this

limited the power of the multiple group analysis so that the comparison was not statistically significant. However, the direction of the difference was consistent with hypothesis 3. The leading effect of externalizing problems on the development of internalizing problems was greater for children who had more conflicts or increasing level of conflicts with their fathers. This is consistent with the prediction from the "failure" model and points out that negative social experience with family members may constitute the pathway through which externalizing problems lead to internalizing problems (Patterson & Capaldi, 1990).

Similarly, consistent with hypothesis 2, internalizing problem also lead to increase in externalizing problems based on the LDS result, but this effect only existed for the group of children who had continuously high level of conflicts with their fathers. This leading effect from internalizing to externalizing problems can be explained by the "masked depression" theory, which suggests that acting out can be used by children to express their distress (Glaser, 1967). The fact that this effect was only detected in the continuously high father-child conflict group implicates that high conflicts with fathers can potentially interrupt the learning and using of effective emotion regulation strategies as well as appropriate ways to express emotional feelings (Bariola, Gullone & Hughes, 2011).

In addition, the moderation effect of parent-child conflicts on the development of internalizing and externalizing problems may also lie in the fact that parent-child conflicts slow down the learning and acquisition of proper behavioral and emotional regulation skills. As children develop, they continuously learn more effective ways to

regulate their behaviors and emotional feelings, and this is indicated by a continuously decreasing internalizing and externalizing problems during childhood (Keiley et al., 2000). From the LDS analysis of the current study, there was a "self-correcting effect" which was represented by a negative association between the change in internalizing problems/externalizing problems and the previous levels of those problems. This negative proportional change probably corresponds to the learning and acquisition of skills and strategies during middle childhood to self-correct behavioral or emotional problems. However, these effects were much smaller for children with continuously or increasingly high father-child conflicts, and this may indicates that father-child conflicts can slow down the learning and acquisition of emotion and behavior regulation skills. Further studies that specifically test this hypothesized effect are needed to confirm this possibility.

Overall, the current study confirmed the second hypothesis that parent-child conflict moderated the co-development pattern of children's internalizing and externalizing problems. Children who experienced continuously high level of conflicts with their fathers not only showed an increasing trajectory in the development of externalizing problems but also more externalizing problems stemming from internalizing problems. This might be due to the fact that high father-child conflicts disrupted the effective learning of emotion regulation skills as well as appropriate ways to express one's feelings. From an intervention perspective, based on the findings of the current study, it is necessary to find effective strategies to improve father-child relationship in order to control the maladaptive development

trend for children who experience high level of father-child conflicts. Effective teaching of emotional regulation skills are also promising to turn around the trend.

4.4 - Study Question 1: LGM vs. LDS on modeling the co-development pattern

In the current study, two different longitudinal models (LGM vs. LDS) were used to test the co-development patterns of internalizing and externalizing problems during middle childhood and the moderation effects of gender and parent-child conflicts on the co-development. The first major Study Question was to address whether LGM and LDS approaches produced similar or distinct results.

LGM models the change over time from a trajectory perspective and in the current study the linear change model was chosen for externalizing problems and the spline change model was chosen for the internalizing problems based on model comparison results. Instead of estimating overall trajectories, LDS offers more parameter estimates that capture the association between changes at each two adjacent time points and the associations between time-consistent changes of the two constructs.

In the current study, LDS model provides information about the cross-lagged effects of one problem on the later change of another problem (γ_{int}, γ_{ext} in Figure 2) as well as how the time consistent changes of both problems associate with each other (i.e. the cross-correlations between the growth factors in Figure 2). As a result, LDS provides more growth information than LGM (Hale et al., 2008) and the cross-lagged effects estimates provide direct test of the hypothesis 1 and hypothesis 2 in the current study. With the LDS model, moderation effects of gender and parent-child conflicts

on the cross-lagged associations were detected, while these effects were not found in the LGM analysis. Given that both models have converged solutions, LDS models the change and the association using various paths and thus are more effective in detecting the existence of the co-development pattern and the moderation effects.

The cross-association coefficients of the intercepts and slopes from the LGM and LDS analyses were different in values and signs. This is because the slopes in the LGM and LDS were estimated in different models with sets of other different parameters to describe the change patterns over time. In LGM, the slopes and intercepts and their loadings to the variables measured at each time are the only parameters to describe the development pattern, while in LDS the slopes only represent time-consistent change and represent the part of change that is not dependent on the previous levels of the variables. While in LGM, all the information about how the change depends on previous levels of the variables comes from the estimated associations between the intercepts and the slopes and the cross-associations between the two in a bivariate model. While in LDS, the dependency of the change on previous levels is also represented in the parameter estimates of proportional changes (βs and γs in Figure 2). Given these differences in model specification, it is likely that the values of slopes from the LGM and LDS analyses and the estimates of all the relevant associations are different.

From the results of the current study, the LDS model offers more detailed information about the growth trends and the cross-associations between the two constructs over time. Also, this approach is more effective in detecting the moderation

effects compared to the LGM approach. For future longitudinal studies of change, LDS should be preferred over LGM when there is no issue of model convergence problem.

4.5 - Study Question 2: Informant differences

The second major Study Question was to test whether results were similar or different between informants. In the current study, mothers' and fathers' reports of their children's internalizing and externalizing problems correlated modestly to moderately across all waves (.16-.55), which is similar to findings of previous studies (Duhig et al., 2000). As has been discussed before, some inconsistency existed between mothers' and fathers' reports when the moderation effects of gender and parent-child conflicts were examined for the co-development patterns between children's internalizing and externalizing problems. There may be two reasons behind this inconsistency in the findings. First, the reason may be that mothers and fathers have different perceptions for their children's internalizing and externalizing problems. Second, the reason may be that the sample that had both mothers' and fathers' reports available were different from the sample that only had mothers' reports.

To test both of this possibility, some post-hoc t-tests was done to examine if there was any difference in mothers' and fathers' reports of their children's internalizing and externalizing problems at Grade 3 (corresponding to the first possibility) and if there was any difference between reports of these two problems at Grade 3 between those the sample that had both mothers' and fathers' reports and the sample that only had mothers' reports (corresponding to the second possibility). The test of difference

between mothers' and fathers' reports of internalizing and externalizing problems at Grade 3 (externalizing: $t=.05,\ p=.96$; internalizing: $t=.91,\ p=.36$) showed no significant results. And the test of the second possibility showed significant difference in the reports of internalizing and externalizing problems between the two samples (externalizing: $t=5.59,\ p<.001$; internalizing: $t=5.10,\ p<.001$). So the inconsistency in the findings between mothers' and fathers' reports on the co-development of internalizing and externalizing problems is more likely due to the difference in samples used in the analyses.

Informant differences in the current study also suggests that when reports from different informants are available, the better practice is to test the hypothesized effects separately using reports from each informant rather than to combine those reports and use composite scores directly without the separate analysis done at first. The benefit of the first approach is that it offers information about consistency and inconsistency in findings from each informant and prevents against the problem of averaging out the effects if the effect only holds based on one informant's reports or the effects are in the opposite direction across informants. This approach can also suggest the necessity of further studies to investigate the reasons underlying the inconsistencies if any is detected. In addition, if the sample sizes vary across informants, the composite score approach can be problematic if the calculation of the composite scores ignores the missing of the reports of one informant (i.e., use average score from all the other informants as the composite score in this case) because participants who have reports from all informants may differ in some important way from those who only have

reports from some of the informants.

Also the inconsistency in findings from mothers' and fathers' reports suggests that it is unlikely that the co-development pattern found in the current study is due to common method bias, such that variables are more likely to associate with each other if they are reported by the same person. If this is the case, the cross-associations between internalizing and externalizing effects would have been detected from both mothers' and fathers' reports as the common method bias should affect the findings in the same way.

4.6 - Implications and limitations

First, the current study showed that the development of internalizing and externalizing problems during middle childhood was intertwined instead of independent. The co-development patterns differ between boys and girls and children with various levels of conflicts with their parents. It is important that intervention strategies designed for reducing internalizing and externalizing problems take into account the individual difference in the co-development patterns because intervention strategies that are more attuned to the individual difference will be more effective (Miller & Hester, 1986). For instance, for boys and children with continuously high level of conflicts with their fathers, intervention strategies with more focus on emotion regulation and expression may be more effective because internalizing problems in these groups can lead to externalizing problems, which can expose these children to greater risks of antisocial behaviors and drug abuse (Fanti & Henrich, 2010; Colder et al., 2013).

Second, compared with LGM analysis, LDS offers more information about the growth patterns and the cross-associations between the co-development patterns of internalizing and externalizing problems and is more effective in detecting individual difference in the co-development patterns (Meredith & Tisak, 1990; McArdle, 2009). Thus, future longitudinal studies should prioritize the use of LDS over LGM for the testing of the growth trajectories.

Third, it is valuable to include multiple informants in the study as the growth patterns may vary across informants(Treutler & Epkins, 2003). Consequently, it may not be valid to consider findings based on just one informant's reports (e.g. mothers' reports) as the general conclusions without further examining the consistency and inconsistency in the findings across reports of different informants (De Los Reyes & Kazdin, 2005).

The current study also has several limitations. First, only questionnaire reports were used to examine the co-development patterns and the sample sizes varied for mothers' and fathers' reports. The study findings might be impacted by self-report bias, such as consistency motif or illusory correlations (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Future studies with multiple methods (e.g. interviews and observations of parent-child interactions) and equivalent sample for each informant are recommended to cross-validate the findings of the current study and examine the effect of methods and samples on the study findings. It also needs to be noted here that future studies using multiple methods are only useful to estimate the effect of potential self-report bias on the findings of the current study, and they are not superior

as they are also subject to other problems, such as overcorrecting the self-report bias (Noordhof et al., 2009).

Second, in the current study the distribution of internalizing and externalizing scores was skewed, and this problem is common when questionnaire developed for clinical screening purpose is used to measure individual difference in community samples. Though analysis method used in the current study is robust to skewness of data, individual difference in internalizing and externalizing problems is not well captured by the current questionnaires and this inadequacy in the measurement may reduce the power of the statistical tests. Future studies may consider using measures that can well capture the individual difference in internalizing and externalizing problems for community samples to improve the power of the study. The other way to deal with the problem of skewness of the measures when applied to community sample is to use alternative quantitative method and software package specifically designed to deal with problem (Asparouhov & Muthen, 2014). The method and the software for non-normal distribution is still under-development and are not available for all kinds of statistical analyses, such as test of moderation.

References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4–18 and 1991 Profile.* Burlington, VT: Department of Psychiatry, University of Vermont.

Achenbach, T. M. (1992). *Manual for the Child Behavior Checklist/2–3 and 1992 Profile*. Burlington, VT: Department of Psychiatry, University of Vermont.

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

Asparouhov, T. & Muthen, B. (2014). Structural equation models and mixture models with continuous non-normal skewed distributions. Web Note 19.

Bariola, E., Gullone, E., & Hughes, E. K. (2011). Child and adolescent emotion regulation: The role of parental emotion regulation and expression. *Clinical Child and Family Psychology Review, 14*(2), 2198-2212.

Boylan, K., Vaillancourt, T., Boyle, M., & Szatmari, P. (2007). Comorbidity of internalizing disorders in children with oppositional defiant disorder. European *Child and Adolescent Psychiatry, 16,* 484–494.

Browne, M., & Nesselroade, JR. (2005). Representing psychological processes with dynamic factor models: some promising uses and extensions of autoregressive moving average time series models. In *Contemporary Advances in Psychometrics*, ed. A Madeau, JJ McArdle, pp. 415 ‑ 52. Mahwah, NJ: Erlbaum

Coie, J. D., & Dodge, K. A. (1998). Aggression and antisocial behavior. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (pp. 779–862). New York, NY: Wiley.

Colder, C., Scalco, M., Trucco, E., Read, J., Lengua, L.,…Hawk, L. (2013).

Prospective associations of internalizing and externalizing problems and their co-occurrence with early adolescent substance use. *Journal of Abnormal Child Psychology, 41,* 667-677.

Cummings, J., Bornovalova, M., Ojanen, T., Hunt, E., MacPherson, L., Lejuez, C. (2013). Time doesn't change everything: The longitudinal course of distress tolerance and its relationship with externalizing and internalizing symptoms during early adolescence. *Journal of Abnormal Child Psychology, 41,* 735-748.

De Los Reyes, A., & Kazdin, A. E. (2005). Informant discrepancies in the assessment of childhood psychopathology: A critical review, theoretical framework, and recommendations for further study. *Psychological Bulletin, 131,* 483–509.

Duhig, A. M., Renk, K., Epstein, M. K., & Phares, V. (2000). Interparental agreement on internalizing, externalizing, and total behavior problems: A meta-analysis. *Clinical Psychology: Science and Practice*, *7,* 435–453.

Elder, G. H., Jr., Conger, R. D., Foster, E. M., & Ardelt, M. (1992). Families under economic pressure. *Journal of Family Issues, 13*, 5-37.

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.

Fanti, K., Henrich, C., Brookmeyer, K., & Kuperminc, G. (2008). Toward a transactional model of parent-adolescent relationship quality and adolescent psychological adjustment. *Journal of Early Adolescence, 28*, 252-276.

Garnefski, N., & Diekstra, R. F. W. (1997). "Comorbidity" of behavioral, emotional, and cognitive problems in adolescence. *Journal of Youth and Adolescence*, *26*, 321-338.

Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology, 16(2),* 313–333.

Hale, W., VanderValk, I., Akse, J., & Meeus, W. (2008). The interplay of early adolescents' depressive symptoms, aggression and perceived parental rejection: A four-year community study. *Journal of Youth and Adolescence*, *37*, 928–940. doi:10.1007/s10964-008-9280-0

Hill, J., & Lynch, M. (1983). The intensification of gender-related role expectations during early adolescence. In J. Brooks-Gunn & A. C. Petersen (Eds.), *Girls at puberty: Biological and psychosocial perspectives* (pp. 201–228). New York: Plenum.

Hink, L., Rhee, S., Corley, R., Cosgrove, V., Hewitt, J., Schulz-Heik, R.,…Waldman, I. (2013). Personality dimensions as common and broadband-specific features for internalizing and externalizing disorders. *Journal of Abnormal Child Psychology, 41,* 939-957.

Hinnant, J. & 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.

Huston, A., & Alvarez, M. (1990). The socialization context of gender role

development in early adolescence. In R. Montemayor, G. Adams, & T. Gullotta (Eds.), *Advances in adolescent development: Vol. 2. The transition from childhood to adolescence* (pp. 156–179). Beverly Hills, CA: Sage.

Jung, T., & Wickrama, K.A.S. (2008). An introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass, 2,* 302–317.

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 Psychology, 31, 267–283.

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(2),* 161–179.

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.

Lee, E. J., & Stone, S. I. (2012). Co-occurring internalizing and externalizing behavioral problems: Mediating effect of negative self-concept. *Journal of Youth and Adolescence, 41,* 717-731. doi:10.1007/s10964-011-9700-4.

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.

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association, 83,* 1198–1202.

Maccoby, E. E., & Jaeklin, C. N. (1987). Gender segregation in childhood. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 20, pp. 239-288). New York: Academic Press.

Maccoby, E. (1990). Gender and relationships: A developmental account. *American Psychologist, 45,* 513-520.

McArdle, J. J. (2009). Latent variable modeling of differences in changes with longitudinal data. *Annual Review of Psychology, 60,* 577–605.

McConaughy, S. H. & Achenbach, T. (1994). Comorbidity of empirically based syndromes in matched general population and clinical samples. *Journal of Child Psychology and Psychiatry, 35,* 1141-1157.

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(3),* 524–538.

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika, 58*, 525–543.

Meredith, W., & Horn, J. (2001). The role of factorial invariance in modeling growth and change. In A. Sayer & L. Collins (Eds.), *New methods for the analysis of change* (pp. 203–240). Washington, DC: American Psychological Association.

Meredith, W., & Tisak, J. (1990). Latent curve analysis. *Psychometrika* 55, 107-122.

Miller, W.R., & Hester, R.K. (1986). Matching problem drinkers with optimal treatments, in: W.R. MILLER & N. HEATHER (Eds), *Treating Addictive Behaviors: Processes of Change* (pp. 175-203). Plenum Press, New York.

Nagin, D. S. (1999). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods, 4,* 139–157.

Newman, D. L., Moffitt, T., Caspi, A., & Silva, P. A. (1998). Comorbid mental disorders: Implications for treatment and sample selection. *Journal of Abnormal Psychology, 107,* 305–311.

Nock, M. K., Kazdin, A. E., Hiripi, E., & Kessler, R. C. (2007). Lifetime prevalence, correlates, and persistence of oppositional defiant disorder: results from the national comorbidity survey replication. *Journal of Child Psychology and Psychiatry, 48,* 703–713.

Nolen-Hoeksema, S. & Girgus, J. (1994). The emergence of gender differences in depression during adolescence. *Psychological Bulletin, 115*, 424-443.

Noordhof, A., Oldehinkel, A. J., & Ormel, J. (2009). *Comorbidity between Internalizing and Externalizing problems in adolescence: fact or artefact?* Unpublished manuscript, Department of Psychology, University of Groningen, Neitherland.

Oland, A. J., & 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(4),* 247–270.

Ollendick, T. H., & Jarrett, M. A. (2009). Evidence-based treatments for adolescent

depression. In C.A. Essau (Ed.), *Treatments for adolescent depression: Theory and practice* (pp. 57-80). Oxford: Oxford University Press.

Pianta, R.C. (1995). Child–Parent Relationship Scale. Unpublished measure, University of Virginia

Patterson, G. R., & Capaldi, D. M. (1990). A mediational model for boys' depressed mood. In J. E. Rolf, & A. S. Masten (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 141–163). New York: Cambridge University Press.

Podsakoff, P., MacKenzie, S., Lee, J. & Podsakoff, N. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 873-903.

Ritakallio, M., Koivisto, A., von der Pahlen, B., Pelkonen, M., Marttunen, M., & Kaltiala-Heino, R. (2008). Continuity, comorbidity and longitudinal associations between depression and antisocial behavior in middle adolescence: a 2-year prospective follow-up study. *Journal of Adolescence, 31,* 355–370.

Scaramella, L. V., Conger, R. D., & Simons, R. L. (1999). Parental protective influences and gender-specific increases in adolescent internalizing and externalizing problems. *Journal of Research on Adolescence, 9,* 111-141.

Schafer J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological Methods, 7*, 147–177.

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.

Thelen, E. (1989). Self-organization in developmental processes: Can systems approaches work? In M. Gunnar & E. Thelen (Eds.), *Systems in development: The Minnesota Symposia on Child Psychology* (Vol.22, pp. 77-117). Hillsdale, NJ: Erlbaum.

Treutler, C. M., & Epkins, C. C. (2003). Are discrepancies among child, mother, and father reports on children's behavior related to parents' psychological symptoms and aspects of parent– child relationships? *Journal of Abnormal Child Psychology, 31,* 13–27.

Vaillancourt, T., Brittain, H., McDougall, P., & Duku, E. (2013). Longitudinal links between childhood peer victimization, internalizing and externalizing problems, and academic functioning: Developmental cascades. *Journal of Abnormal Child Psychology, 41,* 939-957.

Van der Valk, J.C., Van den Oord, E.J., Verhulst, F.C., & Boomsma, D.I. (2003). Genetic and environmental contributions to stability and change in children' s internalizing and externalizing problems. *Journal of the American Academy of Child and Adolescent Psychiatry 42,* 1212 - 1220.

White, B. A., & Kistner, J. A. (2011). Biased self-perceptions, peer rejection, and aggression in children. *Journal of Abnormal Child Psychology, 39*, 645–656.

Wiesner, M. (2003). A Longitudinal latent variable analysis of reciprocal relations between depressive symptoms and delinquency during adolescence. *Journal of Abnormal Psychology, 112*, 633 - 645.

Table 1 *Descriptive Statistics of study main variables from mothers' /fathers' reports (in original scale)*

	Internalizing problems (G3)	Externalizing problems (G3)	Internalizing problems (G4)	Externalizing problems (G4)	Internalizing problems (G5)	Externalizing problems (G5)	Internalizing problems (G6)	Externalizing problems (G6)	Parent-child conflict (G3)	Parent-child conflict (G4)	Parent-child conflict (G5)	Parent-child conflict (G6)
Mean	5.14/4.51	7.33/6.47	4.87/4.42	6.83/6.29	5.27/4.45	6.52/5.50	5.15/4.43	6.19/5.39	16.12/ 14.82	15.95/ 14.86	16.38/ 15.59	16.78/ 15.78
SD	5.13/4.61	6.32/5.22	4.99/4.65	6.13/6.10	5.15/5.15	6.32/6.10	5.39/4.99	6.18/5.86	6.04/5.08	5.89/5.29	5.99/5.14	6.23/5.47
Min	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	7/7	7/7	7/7	7/7
Max	35/29	36/33	36/42	40/49	41/33	39/41	36/37	40/48	32/31	35/33	34/34	33/33
Skew	1.64/1.58	1.23/1.10	1.93/2.40	1.40/1.88	1.94/2.20	1.55/1.94	1.98/2.05	1.48/2.00	.48/.55	.42/.72	.39/.65	.33/.45

Table 2 *Correlations of study main variables from mothers' /fathers' reports (in original scale)*

	1 Internalizing problems (G3)	2 Externalizing problems (G3)	3 Internalizing problems (G4)	4 Externalizing problems (G4)	5 Internalizing problems (G5)	6 Externalizing problems (G5)	7 Internalizing problems (G6)	8 Externalizing problems (G6)	9 Parent-child conflict (G3)	10 Parent-child conflict (G4)	11 Parent-child conflict (G5)	12 Mother-child conflict (G6)
1	-	.55	.75	.49	.65	.41	.61	.39	.45	.42	.34	.34
2	.54	-	.46	.80	.41	.73	.38	.70	.65	.60	.38	.37
3	.63	.45	-	.61	.76	.48	.66	.46	.39	.47	.36	.37
4	.39	.73	.66	-	.51	.80	.41	.76	.55	.65	.56	.56
5	.58	.40	.70	.46	-	.60	.70	.50	.35	.39	.38	.38
6	.37	.67	.55	.73	.65	-	.43	.80	.52	.57	.60	..57
7	.59	.37	.68	.50	.76	.53	-	.55	.34	.37	.35	.40
8	.39	.63	.55	.71	.57	.77	.66	-	.48	.54	.53	.62
9	.37	.62	.32	.49	.30	.44	.28	.43	-	.78	.69	.66
10	.24	.51	.43	.65	.33	.52	.33	.48	.69	-	.75	.70
11	.23	.45	.32	.48	.33	.50	.30	.46	.66	.70	-	.73
12	.28	.49	.37	.52	.35	.52	.41	.60	.63	.69	.71	-

Note. All correlations in the table were significant. Correlations of mothers' ratings were presented in the upper diagonal area, and correlations of fathers' ratings were in the lower diagonal area.

Table 3 *Descriptive Statistics of study main variables across gender groups: boys (n=497) / girls (n=510) from mothers' reports*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.69***/.80***							
3	.77***/.78***	.57***/.67***						
4	.57***/.68***	.78***/.83***	.77***/.83***					
5	.67***/.69***	.52***/.61***	.78***/.78***	.63***/.69***				
6	.48***/.63***	.70***/.76***	.59***/.69***	.79***/.81***	.75***/.86***			
7	.61***/.68***	.41***/.61***	.63***/.75***	.43***/.64***	.73***/.74***	.48***/.67***		
8	.39***/.61***	.62***/.77***	.51***/.65***	.72***/.79***	.58***/.68***	.76***/.82***	.57***/.81***	
Mean	0/0	0/0	-.06/-.72	-.09/-.69	.03/0	-.14/-.14	0/-.04	-.21/-.19
Minimum	-.93/-1.03	-1.15/-1.13	-.97/-1.05	-1.22/-1.14	-.92/-.99	-1.20/-1.12	-.91/-1.01	-1.30/-1.16
Maximum	4.64/4.10	3.48/4.30	4.82/4.82	4.97/4.25	6.23/5.22	4.98/4.07	5.55/5.02	5.57/4.60
skewness	1.75/1.40	1.20/1.23	1.90/1.71	1.47/1.59	2.10/1.55	1.53/1.44	2.07/1.78	1.31/1.46

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001.

Table 4 *Descriptive Statistics of study main variables across gender groups: boys (n=388) /girls (n=383) from fathers' reports*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	74.***/.79***							
3	64.***/.67***	.63***/.71***						
4	57.***/.63***	.77***/.81***	.85***/.90***					
5	58.***/.66***	.56***/.62***	.76***/.68***	.69***/.63***				
6	51.***/.59***	.70***/.73***	.71***/.69***	.79***/.75***	.87***/.84***			
7	55.***/.67***	.48***/.64***	.70***/.66***	.63***/.65***	.73***/.82***	.64***/.75***		
8	51.***/.57***	.66***/.70***	.69***/.65***	.77***/.73***	.70***/.72***	.78***/.83***	.84***/.86***	
Mean	.01/.02	.03/.03	0/-.02	-.02/-.03	-.02/.02	-.14/-.17	0/-.02	-.16/-.24
Minimum	-.99/-.97	-1.23/-1.13	-.99/-.99	-1.19/-1.11	-.97/-.95	-1.20/-1.21	-.97/-.93	-1.23/-1.21
Maximum	4.03/4.48	3.84/3.68	7.11/5.56	6.86/4.92	6.30/5.35	5.71/4.95	6.93/3.65	6.61/4.00
Skewness	1.20/1.53	.86/1.19	2.43/1.76	1.95/1.44	2.14/1.97	1.71/1.64	2.28/1.69	1.98/1.48

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001.

Table 5 *Descriptive Statistics of study main variables across mother-child conflict groups: low conflicts (n=535)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.69***							
3	.03	.01						
4	-.03	.02	.65***					
5	-.04	.001	-.01	.03				
6	-.03	.03	.01	.02	.68***			
7	.10*	.11*	.02	.01	.01	.03		
8	.03	.08	.04	.10*	.06	.09	.60***	
Mean	-.06	-.18	-.04	-.16	.01	-.12	-.08	-.22
Minimum	-1.27	-2.01	-1.69	-2.14	-1.67	-2.01	-1.79	-2.14
Maximum	3.55	3.91	5.91	4.61	5.89	6.56	7.74	4.83
Skewness	1.27	1.07	1.83	1.11	2.21	1.76	2.49	1.20

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 6 *Descriptive Statistics of study main variables across mother-child conflict groups: moderate to low (n=104)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.72***							
3	.09	.18						
4	.03	.19	.65***					
5	-.13	-.02	.001	.05				
6	-.03	.05	.01	.05	.71***			
7	.01	.01	.25*	.18	.02	-.07		
8	.06	.02	.14	.06	.001	.08	.57***	
Mean	.07	.09	.05	-.05	0	-.07	.05	-.01
Minimum	-1.37	-1.56	-1.24	-1.54	-1.15	-1.54	-1.35	-1.30
Maximum	4.13	4.30	3.05	4.56	2.63	3.03	2.80	4.11
Skewness	1.39	1.15	1.19	1.45	1.38	1.43	1.21	1.65

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 7 *Descriptive Statistics of study main variables across mother-child conflict groups: low to moderate (n=90)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.60***							
3	-.07	.04						
4	.09	.25*	.54***					
5	.004	.11	-.07	-.16				
6	.01	-.02	-.06	-.03	.65***			
7	.02	.13	.08	.14	.08	.03		
8	.01	.09	.01	.01	.09	.14	.72***	
Mean	-.05	-.03	.03	-.25	.23	.06	.09	.03
Minimum	-1.21	-2.01	-1.47	-1.83	-1.40	-1.69	-1.67	-2.01
Maximum	3.60	3.10	3.55	2.72	4.52	3.25	5.21	2.97
Skewness	1.42	.95	1.57	1.12	1.54	.99	1.80	.75

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 8 *Descriptive Statistics of study main variables across mother-child conflict groups: high (n=73)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.52***							
3	.08	-.08						
4	.09	.03	.58***					
5	-.08	<.001	.02	.05				
6	-.01	.07	.07	.21	.69***			
7	.08	-.02	-.05	-.02	-.12	-.03		
8	.17	.20	-.11	-.09	-.17	-.08	.73***	
Mean	.02	-.26	-.12	-.28	.11	-.05	.04	-.20
Minimum	-1.09	-2.01	-1.42	-2.14	-1.39	-1.69	-1.19	-1.62
Maximum	1.79	1.91	3.54	1.57	3.07	4.60	2.34	2.91
Skewness	.78	.77	1.95	.21	.94	1.78	.69	1.08

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 9 *Descriptive Statistics of study main variables across mother-child conflict groups: moderate (n=269)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.66***							
3	-.03	-.08						
4	.001	.03	.58***					
5	-.08	<.001	.02	.05				
6	-.01	.07	.07	.21	.69***			
7	.08	-.02	-.05	-.02	-.12	-.03		
8	.17	.20	-.11	-.09	-.17	-.08	.73***	
Mean	.04	-.07	0	-.11	-.03	-.17	-.06	-.18
Minimum	-1.63	-2.14	-1.64	-2.01	-1.28	-2.01	-1.30	-2.01
Maximum	5.26	5.48	5.08	3.70	4.36	2.60	4.24	2.75
Skewness	1.92	1.38	1.81	.89	1.44	.94	1.62	.69

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 10 *Descriptive Statistics of study main variables across father-child conflict groups: moderate (n=632)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.74***							
3	.61***	.60***						
4	.53***	.73***	.84***					
5	.55***	.48***	.63***	.54***				
6	.45***	.62***	.58***	.66***	.81***			
7	.55***	.46***	.58***	.51***	.70***	.58***		
8	.17***	.60***	.54***	.63***	.59***	.74***	.74***	
Mean	.05	.03	-.01	-.11	-.01	-.28	-.03	-1.91
Minimum	-.96	-1.30	-.96	-1.23	-.93	-1.32	-.93	-2.98
Maximum	5.26	4.19	3.77	4.44	6.22	5.52	5.11	2.66
Skewness	1.60	.76	1.48	1.17	2.41	1.66	2.18	1.29

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 11 *Descriptive Statistics of study main variables across father-child conflict groups: low to high (n=45)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.78***							
3	.60***	.67***						
4	.57***	.77***	.90***					
5	.71***	.74***	.84***	.82***				
6	.61***	.78***	.82***	.88***	.93***			
7	.77***	.75***	.78***	.81***	.89***	.83***		
8	.72***	.77***	.79***	.84***	.87***	.86***	.98***	
Mean	0	0	.31	.19	.49	.29	.59	.37
Minimum	-.73	-.85	-.71	-.89	-.64	-.87	-.63	-.87
Maximum	1.84	2.24	5.30	5.17	4.40	4.25	4.97	4.93
Skewness	1.06	1.05	2.90	2.71	1.89	1.77	1.89	1.96

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 12 *Descriptive Statistics of study main variables across father-child conflict groups: high (n=92)*

	1 internalizing problems (G3)	2 externalizing problems (G3)	3 internalizing problems (G4)	4 externalizing problems (G4)	5 internalizing problems (G5)	6 externalizing problems (G5)	7 internalizing problems (G6)	8 externalizing problems (G6)
2	.72***							
3	.68***	.56***						
4	.59***	.81***	.69***					
5	.63***	.58***	.61***	.58***				
6	.58***	.77***	.58***	.74***	.81***			
7	.51***	.52***	.58***	.58***	.72***	.68***		
8	.50***	.73***	.54***	.75***	.64***	.79***	.72***	
Mean	-.01	.02	.08	.13	.02	.02	-.08	-.18
Minimum	-1.42	-1.88	-1.44	-1.52	-1.50	-1.88	-1.40	-1.88
Maximum	2.76	2.44	3.85	2.62	2.62	2.98	2.37	2.98
Skewness	.66	.40	1.20	.35	.54	.52	.80	.81

Note. Variable scores are factor scores derived from the measurement model for boys and girls, variances are fixed 1 for model identification. *p <. 05, **p <. 01, ***p <. 001

Table 13 *Little's Missing Completely at Random (MCAR) tests for mothers' reports on internalizing and externalizing problems*

	Withdrawal	Somatic	Anxiety/Depression	Aggression (Grade3-Grade5)	Aggression (Grade4-Grade6)	Deliquency
Chi-square	34.50	30.79	40.50	15.85	.791	40.00
DF	28	28	28	9	9	28
P value	.19	.33	.06	.07	.54	.07

Table 14 *Little's Missing Completely at Random (MCAR) tests for fathers' reports on internalizing and externalizing problems*

	Withdrawal	Somatic	Anxiety /Depression	Aggression (G3-G4)	Aggression (G4-G5)	Aggression(G5-G6)	Delinquency (G3-G4)	Delinquency (G4-G5)	Delinquency (G5-G6)
Chi-square	24.16	27.62	31.68	23.59	22.91	9.39	14.96	13.62	2.68
DF	28	28	28	2	2	2	2	2	2
P value	.67	.49	.29	.00	.00	.01	.001	.001	.26

Table 15 *Parent-child conflicts latent class growth analysis result*

Reporter	Models	BIC	Entropy	LMR
Mother	2-class model	22523.81	.59	P<.001
	3-class model	22522.36	.73	P<.001
	4-class model	22499.62	.64	P=.002
	5-class model	22496.10	.71	P=.04
	6-class model	22503.00	.67	P=.30
Father	2-class model	13744.67	.68	P=.05
	3-class model	13742.59	.71	p = .02
	4-class model	13759.83	.58	p = .92

Table 16 *LDS model estimates for the moderation effect of gender*

Gender	ΔINT on INT	ΔEXT on EXT	ΔINT on EXT	ΔEXT on INT	I_{int} with I_{ext}	I_{int} with S_{ext}	I_{ext} with S_{int}	S_{int} with S_{ext}	I_{int}	I_{ext}	S_{int}	S_{ext}
Mother: Boys	*-.61****	-.76***	.04	.19*	*.51****	*.49****	.58***	*.64****	.06	.08	.04	-.11*
Mother: Girls	*-.85****	-.73***	.04	-.01	*.80****	*.68****	.69***	*.82****	.03	.02	.07	-.11*
Father: Boys	-.95***	-.63***	.15*	-.09	.50***	.63***	.59***	.90***	.02	.09	-.03	*-.10*$^{+}$
Father: Girls	-1.05***	-.69***	.20*	-.01	.33***	.67***	.74***	.90***	.05	.03	.05	*-.19**

Note. $^{*}p <$ .05, $^{**}p <$ .01, $^{***}p <$ .001. Estimates differ across gender are in italics.

Table 17 *LGM model estimates for the moderation effect of mother-child conflicts*

Mother-child conflict	I_{int}	I_{ext}	S_{int}	S_{ext}	I_{int} with I_{ext}	I_{int} with S_{int}	I_{int} with S_{ext}	I_{ext} with S_{int}	I_{ext} with S_{ext}	S_{int} with S_{int}
Low (n=535)	-.04	-.16***	-.003	-.006	NA	NA	NA	NA	NA	NA
Moderate to low (n=104)	.05	.03	-.003	-.03	.97***	NA	NA	NA	NA	NA
Low to moderate (n=90)	-.05	-.16	.06	.06	NA	NA	NA	NA	NA	.78**
High (n=73)	-.03	-.26***	.03	.04	NA	NA	NA	NA	NA	NA
Moderate (n=269)	.04	-.07	-.03	-.04	NA	NA	NA	NA	NA	NA

Note. *p <. 05, **p <. 01, ***p <. 001, NA = not applicable.

Table 18 *LGM model estimates for the moderation effect of father-child conflicts*

Father-child conflicts	I_{int}	I_{ext}	S_{int}	S_{ext}	I_{int} with I_{ext}	I_{int} with S_{int}	I_{int} with S_{ext}	I_{ext} with S_{int}	I_{ext} with S_{ext}	S_{int} with S_{ext}
Low (n=632)	4.21^{***}	.03	$-.09^{+}$	$-.02^{*}$	$.97^{***}$	-.11	-.08	-.14	-.13	$.94^{***}$
Low to high (n=45)	5.35^{***}	.05	1.1^{***}	$.20^{***}$	$.97^{***}$	NA	NA	NA	NA	NA
High (n=92)	7.49^{***}	-.02	.04	-.02	$.91^{***}$	$-.54^{***}$	$-.54^{***}$	$-.51^{***}$	$-.56^{***}$	$.96^{***}$

Note. $^{*}p <. 05$, $^{**}p <. 01$, $^{***}p <. 001$.

Table 19 *LDS model estimates for the moderation effect of mother-child conflicts*

Mother-child conflicts	ΔINT on INT	ΔEXT on EXT	ΔINT on EXT	ΔEXT on INT	I_{int} with I_{ext}	I_{int}	I_{ext}	S_{int}	S_{ext}
Low (n=535)	-1.04***	-.97***	.04	.002	.01	-.06	*-.18****	-.04	*-.16****
Moderate to Low (n=104)	-.97***	-.86***	.02	-.09	.17	.07	.03	.09	-.04
Low to moderate (n=90)	-.92***	-.89***	-.12	-.01	-.20	.05	.09	-.04	-.06
High(n=73)	-1.05***	-.98***	.04	-.07	-.15	.02	*-.26***	.03	*-.18***
Moderate (n=269)	-1.07***	-.91***	.08	-.04	.22	.04	-.02	-.07	-.14

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

Table 20 *LDS model estimates for the moderation effect of father-child conflicts*

Father-child conflicts	ΔINT on INT	ΔEXT on EXT	ΔINT on EXT	ΔEXT on INT	I_{int} with I_{ext}	I_{int}	I_{ext}	S_{int}	S_{ext}
Low (n=632)	*-1****	*-.84****	.18**	*.09*	.49***	.05	.03	*.001*	*-.1****
Low to high (n=45)	-.60***	*-.27*^{**a}	.40**	*.09*	.42**	0	0	*.30***	*.14****
High (n=92)	*-.69****	*-.46****	.33**	*.17**	.34**	-.02	.02	*-0.02*	*-.04*

Note. *p <. 05, **p <. 01, ***p <. 001, [a] ΔEXT on EXT is marginally different for Low to High and High. Estimates differ across different father-child conflict levels are in italics

Table 21 *Measurement invariance models of internalizing and externalizing problems across gender*

Reporter/Children gender	Model name	x^2 (df)	CFI	RMSEA	Δx^2 (Δdf)	
Mother/Boys	1a Unconstrained	36.9 (17)	.990	.049		-
	2a Structural Invariance	37.46(32)	.997	.019	7.32(15)	model 2a vs.1a
	3a Strong Invariance	48.45(41)	.996	.019	11.37(9)	model 3a vs.2a
Mother/Girls	1b Unconstrained	60.74(16)	.982	.075		-
	2b Structural Invariance	51.44(31)	.992	.036	1.85(9)	model 2b vs. 1b
	3b Strong Invariance	67.02(40)	.989	.037	15.96(9)	model 3b vs. 2b
Father/Boys	1c Unconstrained	47.54(16)	.982	.071		-
	2c Structural Invariance	38.75(31)	.996	.025	5.79(15)	model 2c vs. 1c
	3c Strong Invariance	54.06(40)	.992	.030	14.41(9)	model 3c vs. 1c
Father/Girls	1d Unconstrained	28.43(17)	.992	.042		-
	2d Structural Invariance	38.70(31)	.995	.025	12.14(14)	model 2d vs. 1d
	3d Strong Invariance	53.47(40)	.991	.030	13.90(9)	model 3d vs. 1d

Table 22 *Measurement invariance models of internalizing and externalizing problems across parent-child conflicts trajectories*

Reporter/conflicts	Model name	x^2 (df)	CFI	RMSEA	Δx^2 (Δdf)
Mother/Low	1a Unconstrained	50.20(16)	.976	.066	-
	2a Structural Invariance	56.89(31)	.982	.041	10.53(15) model 2a vs 1a
	3a Strong Invariance	75.10(40)	.975	.042	10.51(9) model 3a vs.2a
Mother/Moderate to low	1b Unconstrained	54.72(18)	.905	.142	-
	2b Structural Invariance	43.10(31)	.969	.062	1.85(9) model 2b vs. 1b
	3b Strong Invariance	52.55(44)	.978	.044	6.34(13) model 3b vs.1b
Mother/Low to moderate	1c Unconstrained	38.76(19)	.947	.111	-
	2c Structural Invariance	60.88(35)	.931	.093	24.71(16) model 2c vs.1c
	3c Strong Invariance	69.70(44)	.931	.083	20.18(15) model 3c vs.1c
Mother/High	1d unconstrained	35.78(20)	.954	.109	-
	2d structural invariance	44.08(35)	.974	.063	9.37(15) model 2d vs.1d
	3d strong invariance	48.25(44)	.988	.038	3.84(9) model 3d vs.1d
Mother/Moderate	1e unconstrained	19.76(16)	.997	.031	-
	2e structural invariance	23.13(31)	1.00	0	5.53(15) model 2e vs.1e
	3e strong invariance	32.10(40)	1.00	0	9.79(9) model 3e vs.1e
Father/Low	1f Unconstrained	23.77(16)	.910	.090	-
	2f Structural Invariance	43.05(31)	.990	.030	19.67(15)
	3f Strong Invariance	59.51(42)	.990	.030	17.25(11)
Father/Low to high	1g Unconstrained	23.65(16)	.990	.100	-
	2g Structural Invariance	47.48(31)	.990	.100	23.56(15) model 1 vs. model 2
	3g Strong Invariance	52.51(40)	.990	.080	4.09(9)
Father/High	1h Unconstrained	48.40(20)	.910	.120	-
	2h Structural Invariance	63.88(35)	.910	.090	15.25(15)
	3h Strong Invariance	79.21(50)	.910	.080	12.80(15)

Table 23 *LGM with gender as the moderator*

Reporter	Model name	χ^2 (df)	CFI	RMSEA	$\Delta\chi^2$ (Δdf)
Mothers	1a. unconstrained	157.66(41)	.976	.073	-
	2a. equal correlations between I_{int} and I_{ext} across gender	164.94(42)	.975	.074	6.99(1)** model 2a vs. 1a
	3a. equal correlations between I_{int} and S_{int} across gender	156.63(42)	.977	.071	.76(1) model 3a vs. 1a
	4a. equal correlations between I_{int} and S_{ext} across gender	156.63(42)	.977	.071	.14(1) model 4a vs. 1a
	5a. equal correlations between I_{ext} and S_{int} across gender	157.58(42)	.977	.072	1.77(1) model 5a vs. 1a
	6a. equal correlations between I_{ext} and S_{ext} across gender	156.24(42)	.977	.071	.03(1) model 6a vs. 1a
	7a. equal correlations between I_{int} and I_{ext} across gender	157.27(42)	.977	.071	.49(1) model 7a vs. 1a
Fathers	1b. unconstrained	133.46(44)	.977	.073	-
	2b. equal correlations between I_{int} and I_{ext} across gender	134.86(45)	.977	.072	1.31(1) model 2b vs.1b
	3b. equal correlations between I_{int} and S_{int} across gender	129.35(45)	.978	.070	.002(1) model 3b vs.1b
	4b. equal correlations between I_{int} and S_{ext} across gender	130.24(45)	.978	.070	.01(1) model 4b vs.1b
	5b. equal correlations between I_{ext} and S_{int} across gender	132.04(45)	.978	.071	.29(1) model 5b vs.1b
	6b. equal correlations between I_{int} and I_{ext} across gender	130.80(45)	.978	.070	.09(1) model 6b vs.1b
	7b. equal correlations between S_{int} and I_{ext} across gender	136.36(45)	.977	.073	2.87(1)+ model 7b vs.1b
	8b. equal S_{ext} across gender	135.94(45)	.977	.072	2.16(1) model 8b vs.1b

Note. I_{int} = intercept of the trajectory of internalizing problems, I_{ext} = intercept of the trajectory of externalizing problems, S_{int} = slope of the trajectory of internalizing problems, S_{ext} = intercept of the trajectory of externalizing problems, $^{+}$ $p<.10$, *p <. 05, **p <. 01, ***p <. 001.

Table 24 *LDS with gender as the moderator*

Reporter	Model name	χ^2 (df)	CFI	RMSEA	$\Delta\chi^2$ (Δdf)
other	1a unconstrained	126.93(42)	.983	.062	-
	2a equal β_{int} across gender	130.68(43)	.982	.062	3.75(1)* model 2a vs.1a
	3a equal β_{ext} across gender	127.43(43)	.983	.064	.05(1) model 3a vs.1a
	4a equal correlations between I_{int} and I_{ext} across gender	131.27(43)	.982	.062	3.89(1)* model 4a vs.1a
	5a equal correlations between I_{int} and S_{int} across gender	125.60(43)	.983	.060	2.33(1) model 5a vs.1a
	6a equal correlations between I_{int} and S_{ext} across gender	134.33(43)	.982	.063	6.82(1)** model 6a vs.1.
	7a equal correlations between I_{ext} and S_{int} across gender	129.15(43)	.983	.061	2.25(1) model 7a vs.1a
	8a equal correlations between I_{ext} and S_{ext} across gender	131.08(43)	.982	.062	3.76(1)* model 8a vs.1a
	9a equal correlations between S_{int} and S_{ext} across gender	131.55(43)	.982	.062	4.71(1)* model 9a vs.1a
Father	1b unconstrained	83.45(36）	.987	.058	-
	2b equal β_{int} across gender	84.59(37)	.988	.058	1.39(1) model 2b vs.1b
	3b equal β_{ext} across gender	83.11(37)	.988	.057	.03(1) model 3b vs.1b
	4b equal γ_{int} across gender	84.58(37)	.988	.058	1.00(1) model 4b vs.1b
	5b equal correlations between I_{int} and I_{ext} across gender	83.53(37)	.988	.057	.40(1) model 5b vs.1b
	6b equal correlations between I_{int} and S_{int} across gender	82.90(37)	.988	.057	.54(1) model 6b vs.1b
	7b equal correlations between I_{int} and S_{ext} across gender	82.04(37)	.989	.056	.002(1) model 7b vs.1b
	8b equal correlations between I_{ext} and S_{int} across gender	82.82(37)	.988	.057	.37(1) model 8b vs.1b
	9b equal correlations between I_{ext} and S_{ext} across gender	82.13(37)	.988	.056	.02(1) model 9b vs.1b
	10b equal correlations between S_{int} and S_{ext} across gender	80.40(37)	.989	.055	.13(1) model 10b vs.1b

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

Table 25 *LDS with parent-child conflicts as the moderator*

Reporter	Model name	χ^2 (df)	CFI	RMSEA	$\Delta\chi^2$ (Δdf)
Mother	1a unconstrained	106.43(103)	.998	.012	-
	2a equal β_{int} across conflict levels	109.39(107)	.990	.010	2.65(4) model 2a vs.1a
	3a equal β_{ext} across conflict levels	108.55(107)	.998	.008	2.06(4) model 3a vs.1a
Father	1b unconstrained	85.14(56)	.993	.045	-
	2b equal β_{int} between low and high conflict groups	94.09(57)	.991	.050	$7.49(1)^{**}$ model 2b vs.1b
	3b equal β_{ext} between low and low to high conflict groups	97.91(57)	.990	.053	$33.49(1)^{***}$ model 3b vs.1b
	4b equal β_{ext} between low and high conflict groups	98.44(57)	.990	.053	$12.41(1)^{**}$ model 4b vs.1b
	5b equal β_{ext} between low to high and high conflict groups	87.39(57)	.993	.046	$2.73(1)^{+}$ model 5b vs.1b
	6b equal γ_{int} between low and low to high conflict groups	87.41(57)	.993	.046	$3.10(1)^{+}$ model 6b vs.1b
	7b equal correlation between I_{int} and I_{ext} among all conflict groups	91.90(62)	.993	.043	7.47(6) model 7b vs.1b

Note. $^{+}$ $p<.10$, $*p<.05$, $**p<.01$, $***p<.001$.

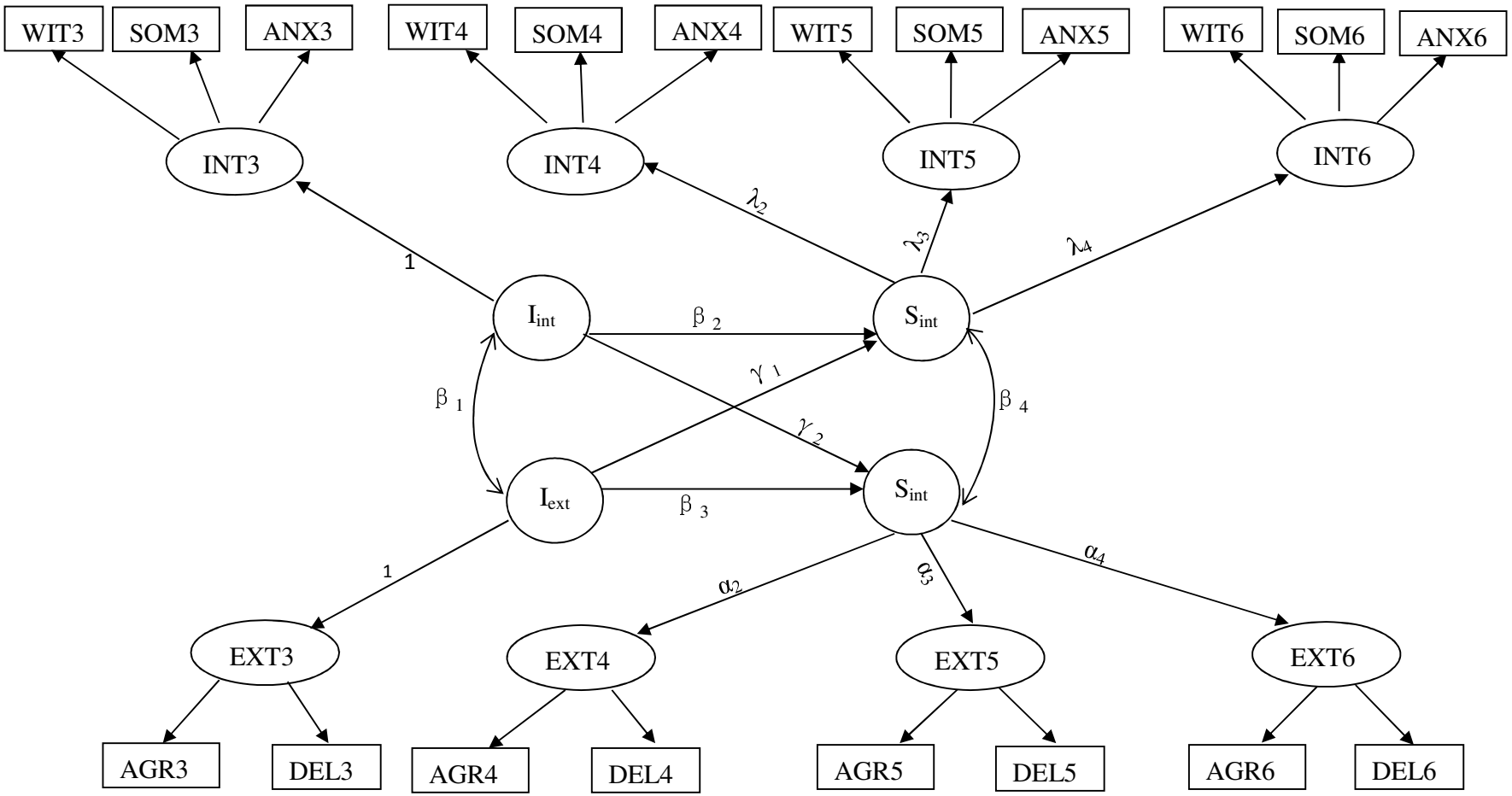

Figure 1. Bivariate LGM of internalizing (int) and externalizing (ext) problems

Note. INT=internalizing problems; EXT=externalizing problems; WIT=withdrawal; SOM=somatic complains; ANX=anxiety/depression; AGR=aggression; DEL=deliquency

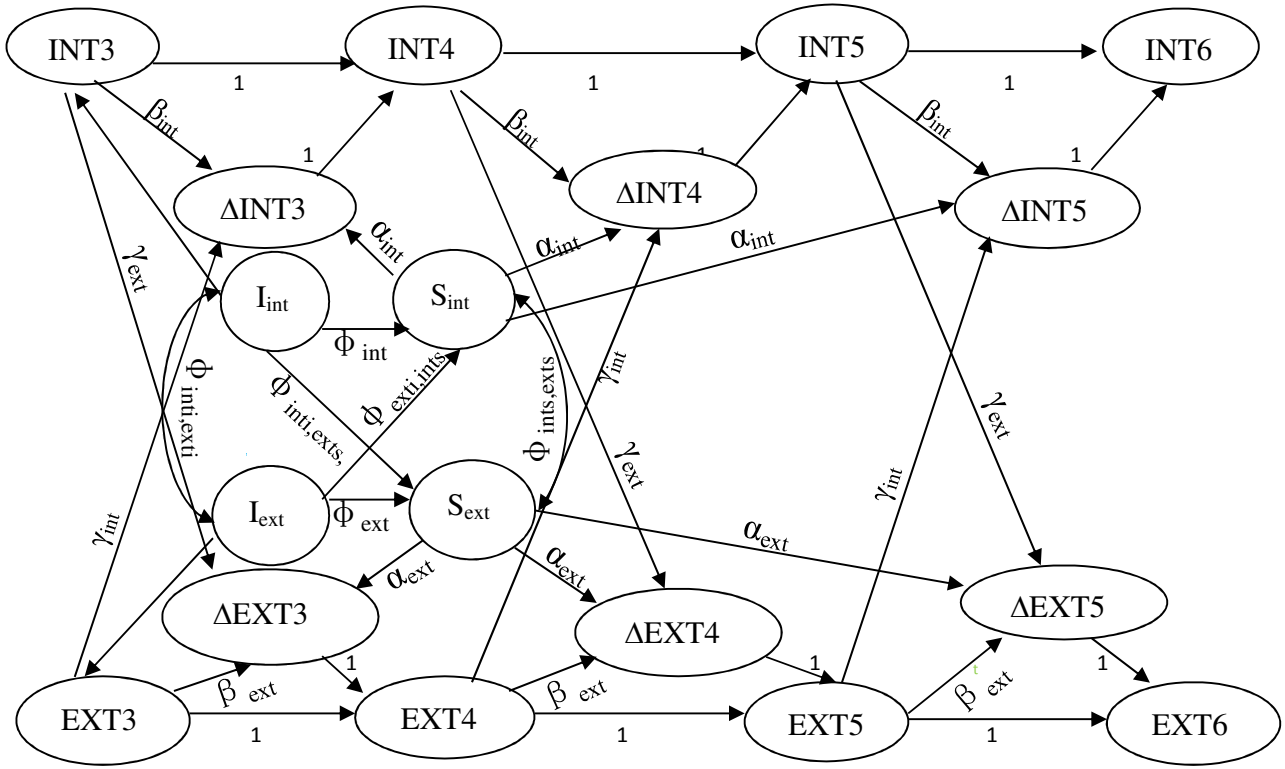

Figure 2. Bivariate LDS model of internalizing (int) and externalizing (ext) problems

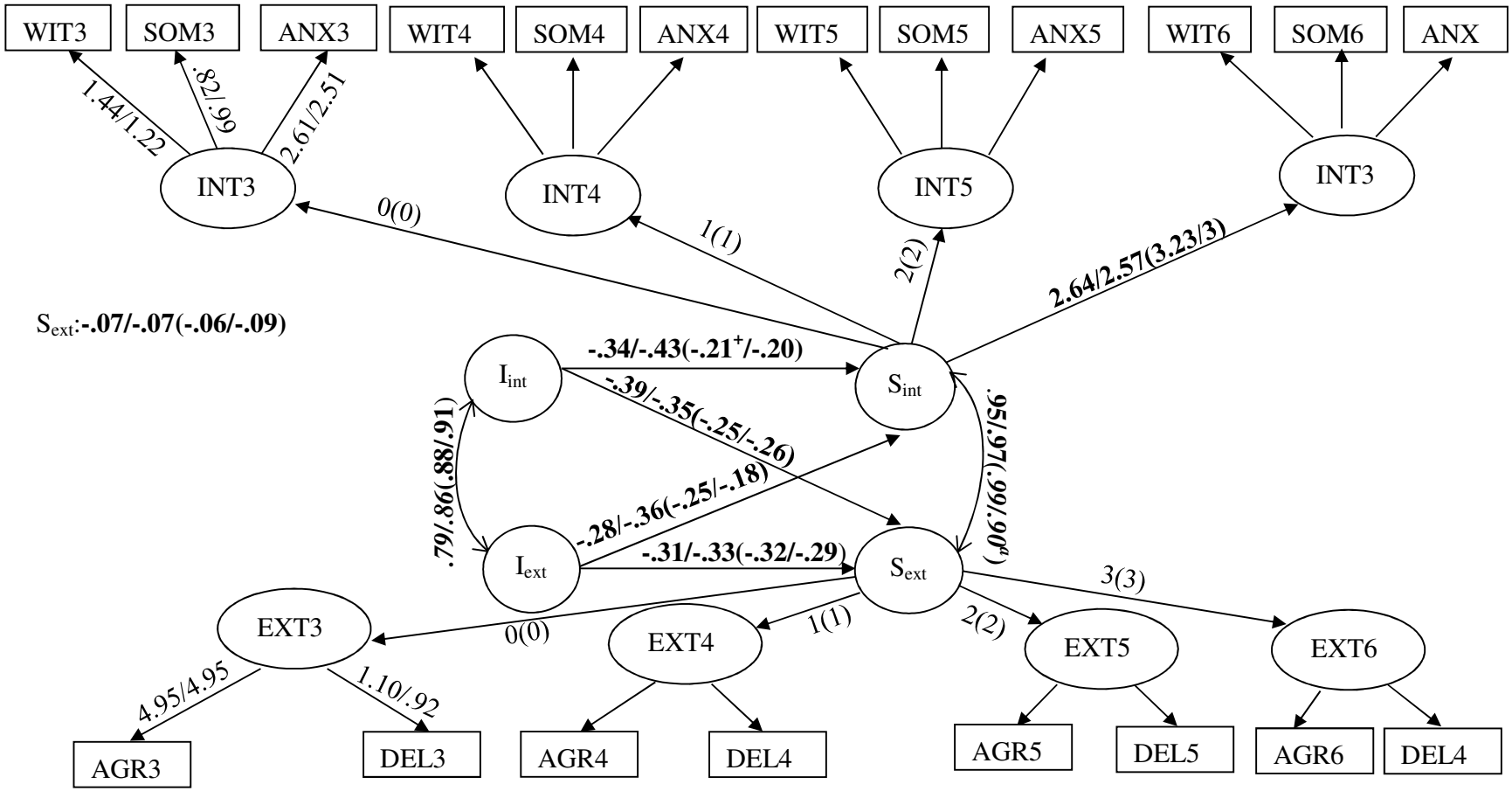

Figure 3. LGM model estimates for the moderation effect of gender

Note. Significant results are in bold characters and estimates differ across gender are in italics, estimates for boys are presented before girls separated by"/" and estimates based on fathers' report are in parentheses. The intercepts of internalizing and externalizing problems and the slope of internalizing problems are not significantly different from zero.