The Codevelopment of Sympathy and Overt Aggression from Middle Childhood to Early Adolescence

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Abstract

We assessed the extent to which feelings of sympathy and aggressive behaviors co-developed from 6 to 12 years of age in a representative sample of Swiss children (N = 1,273). Caregivers and teachers reported children's sympathy and overt aggression in three-year intervals. Second-order latent curve models indicated general mean-level declines in sympathy and overt aggression over time, although the decline in sympathy was relatively small. Importantly, both trajectories were characterized by significant inter-individual variability. A bivariate second-order latent curve model revealed a small–moderate negative correlation between the latent slopes of sympathy and overt aggression, suggesting an inverse co-developmental relationship between the constructs from middle childhood to early adolescence. In terms of predictive effects, an autoregressive cross-lagged model indicated a lack of bidirectional relations between sympathy and overt aggression, underscoring the primacy of the variables' rank-order stability. We discuss the co-development and developmental relations of sympathy and aggression, their potential conjoint social-emotional mechanisms, and the practical implications thereof.

Keywords: sympathy, overt aggression, co-development, childhood, adolescence, second-order latent curve model

The Co-Development of Sympathy and Overt Aggression from Middle Childhood to Early Adolescence

The role of sympathy in children's aggressive behavior has received considerable attention from developmental scientists over the past three decades (Joliffe & Farrington, 2006; MacEvoy & Leff, 2012; Miller & Eisenberg, 1988). The ability to sympathize, which often includes encoding and experiencing others' emotional states, is thought to help children anticipate and recognize the negative consequences of aggressive acts (for a review, see Eisenberg, Spinrad, & Morris, 2014). Children with high levels of sympathy engage in less frequent and less severe aggression (Lovett & Sheffield, 2007; van Noorden, Haselager, Cillessen, & Bukowski, 2014). Such findings yield some support for social-emotional interventions to prevent and reduce aggressive behavior, which operate under the conceptual premise that fostering sympathy and related capacities in children will result in corresponding decreases in their aggression (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Malti, Chaparro, Zuffianò, & Colasante, 2016). However, the extent to which a child's mean-level growth in sympathy is related to a parallel, mean-level decrease in his or her aggression has not been empirically detailed within a longitudinal framework. We aimed to bridge this theory–evidence gap by investigating the co-development of sympathy and aggression from age 6 to 12 in a large, representative sample of Swiss children. In addition, given the scarcity of past longitudinal studies analyzing predictive relations between sympathy and aggression, we aimed to investigate their possible reciprocal effects and thereby offer a fuller picture of their developmental relations.

The Development of Sympathy from Middle Childhood to Early Adolescence

In line with Eisenberg et al. (2014), we define sympathy as a specific empathy-related response characterized by a feeling of concern for another that often, but not always, stems from a shared experience of their distress or emotional state. This differentiates it from empathy, which always involves sharing another's emotional state but does not always result in concern for that other (Eisenberg, Spinrad, & Knafo, 2015). As pointed out by several scholars (e.g., Eisenberg et al., 2014; Jordan, Dorsa, & Bloom, 2016), sympathy, in comparison to empathy, is likely to be more strongly associated with prosocial and aggressive behaviors across development. The mere vicarious experience of another's emotional state (i.e., empathy) "may be too remote from the behavior to predict it" (Vachon, Lynam, & Johnson, 2014, p. 766) and may result in aversive, personally distressing emotional reactions that often impede other-oriented behaviors (Eisenberg et al., 2014). Accordingly, we focused on sympathy in the present analysis because its core affective component of other-oriented concern is particularly likely to motivate children to reconcile and/or avoid aggressive acts against others (also see Colasante, Zuffianò, & Malti, 2016).

According to prominent developmental theories (Eisenberg, 2000; Hoffman, 2000) and growing empirical research (e.g., Davidov, Zahn-Waxler, Roth-Hanania, & Knafo, 2013), precursors of sympathy—such as resonant negative affect—exist from the first year of life. Feelings of other-oriented concern appear to increase in frequency from childhood to early adolescence (for a meta-analytic review reporting age-related increases in self-reported and observed measures of empathy-related responding, including sympathy, see Eisenberg & Fabes, 1998; Eisenberg et al., 2015). A number of viable explanations for this developmental increase in sympathy have been proposed, including: enhanced cognitive abilities that allow children to assume and understand others' perspectives (Hoffman, 2000), the socialization of other-oriented

tendencies (Grusec & Hastings, 2015), and the refinement of social-emotional competencies from spending more time with peers (i.e., building positive friendships through sympathy and related prosocial behavior; Rubin, Bukowski, & Laursen, 2011).

However, these findings were primarily derived from cross-sectional data and thereby reflect sympathetic differences between younger and older children. Longitudinal studies documenting the intra-individual, mean-level development of sympathy from middle childhood to early adolescence have been relatively scarce. An examination of self-reported sympathy from age 6 to 9 found that the majority of children followed increasing (47%) or high-stable (43%) trajectories, while the remainder showed consistently low (10%) levels (Malti, Eisenberg, Kim, & Buchmann, 2013). Lam, Solmeyer, and McHale (2012) found gender differences in the mean-level development of self-reported empathy from age 7 to 14: girls showed a non-linear increase, whereas boys remained relatively stable. Kienbaum (2014) documented increases in child- and caregiver-reported sympathy from age 5 to 7, but mean-level stability in teacher reports (all informants showed moderate to high rank-order stability [*r*s = .21 to .78]). Collectively, these few longitudinal studies suggest that the normative, mean-level development of sympathy during this transitional period is characterized by an increase, although stability may also exist depending on child characteristics and/or informant.

The Development of Aggression from Middle Childhood to Early Adolescence

The study of aggressive behavior has a rich tradition in developmental psychology (for reviews, see Eisner & Malti, 2015; Tremblay, 2000, 2010). Here, we focused on overt aggressive acts—those that occur in plain view, such as fighting and bullying—because their negative consequences, namely physical pain and crying, are immediately apparent and carry strong emotional resonance. In comparison to covert aggressive acts, such as stealing and spreading

rumors, which typically occur in the absence of the victim's plight (Card, Stucky, Sawalani, & Little, 2008), the harmful effects of overt aggression may be more likely to capture children's attention and trigger their sympathetic concern. Children's aggressive behavior is associated with a wide range of concurrent and subsequent problems, from academic impairment and peer rejection in childhood and early adolescence (Brennan, Shaw, Dishion, & Wilson, 2012; Ladd, Ettekal, Kochenderfer-Ladd, Rudolph, & Andrews, 2014) to substance abuse and criminality in later adolescence and adulthood (Hawkins, Catalano, & Miller, 1992; Loeber & Farrington, 2012). Not surprisingly then, researchers have aimed to understand the normative development of aggression and—more specifically—its early developmental correlates and precursors.

Longitudinal evidence generally indicates a decreasing trend in aggression from middle to late childhood (depending on the subtype of aggression in question; see Eisner & Malti, 2015), although a subset of life-course-persistent offenders exhibit high-stable levels over childhood and well into adulthood (Moffitt, 2003). Overarching declines in aggression have been attributed to a number of developmental factors, including: enhanced impulse control and delay of gratification (Eisenberg, 2000), the socialization of norms for appropriate social behavior (Dodge, Coie, & Lynam, 2006; Rubin et al., 2011), and the acquisition of social-emotional skills that help children anticipate and understand their own and others' negative emotional states (citation withheld for peer review).

The Co-Development of Sympathy and Aggression from Middle Childhood to Early Adolescence

From a social-emotional, developmental perspective, an early foundation of sympathy is critical to impede aggressive acts and thereby form and maintain positive, other-oriented social connections with peers and adults. As children develop the ability to sympathize, they

systematically connect their actions to the misfortunes of their victims and often experience an other-oriented, negatively valenced emotional state. Such states likely motivate children to refrain from aggressive acts and, over time, iterations of this sympathetic process may contribute to the development of internalized moral standards against harming others (citations withheld for peer review). This theorizing aligns with integrative conceptual models of social-emotional development, which stress that sympathy shifts children's attention from the perceived benefits of aggressive behavior to the morally salient aspects of such acts, and spurs related protective emotions, such as guilt (citation withheld for peer review; Frick 2012; Hoffman, 2000; Malti & Ongley, 2014). The diverse protective functions of sympathy have gained recent empirical support: high levels of sympathy have been shown to disrupt the well-established link between anger and aggression (Colasante, Zuffianò, & Malti, 2015), and may compensate for a lack of guilt to promote the sharing of valued resources with hypothetical peers (Ongley & Malti, 2014).

Many cross-sectional studies have documented an inverse relationship between other-oriented concern and aggressive behavior (e.g., Caravita, Di Blasio, & Salmivalli, 2009; Joliffe & Farrington, 2006), suggesting that children who feel less concern for the target(s) of their harmful acts are more aggressive than their sympathetic counterparts. A meta-analysis by Miller and Eisenberg (1988) found a significant, albeit modest, negative association between sympathy and aggression in childhood and adolescence when sympathy was assessed with questionnaires, but not when it was assessed with vignettes. More recent reviews have revealed mixed age-related findings: Lovett and Sheffield (2007) found a stronger negative relationship between sympathy and aggression in studies of adolescents versus those of children, whereas van Noorden and colleagues (2014) did not find age differences in the empathy–bullying link across studies. In light of these inconsistencies, researchers have emphasized delineating the roles of

specific empathy-related responses, such as sympathy, in the development of aggression, and the importance of using longitudinal designs to assess their relative impact on aggression at different theory-driven periods of development (Malti et al., 2016).

Only a few longitudinal studies with relatively short time frames have investigated developmental links between sympathy and aggression. Stavrinides, Georgiou, and Theofanous (2010) found a reciprocal relation between self-reported affective empathy (a construct closely related to sympathy) and bullying in a sample of 11-year-olds: higher initial levels of affective empathy predicted less bullying six months later and vice versa (controlling for their respective stabilities over time). A similar study found that sympathy at age 12 predicted less aggressive behavior one year later, but less so when the auto-regressive prediction of aggression was accounted for (Carlo, Mestre, Samper, Tur, & Armenta, 2010; also see Mößle, Kliem, & Rehbein, 2014).

However, none of these studies investigated the extent to which intra-individual, mean-level increases in sympathy over time were related to intra-individual, mean-level decreases in aggression over the same period. Despite this lack of requisite evidence, many social-emotional learning programs explicitly or implicitly assume that fostering sympathy in a child will simultaneously reduce his or her level of aggressive conduct (Durlak et al., 2011; Malti et al., 2016).

Given that many of the underlying factors—social (e.g., parenting), cognitive (e.g., perspective taking), and emotional (e.g., emotion regulation)—conducive to children's sympathetic development also underlie the development of their aggressive behavior (Eisner & Malti, 2015; Lovett & Sheffield, 2007), we assume that at least some co-development of these constructs exists. The co-development of sympathy and aggression, indeed, may be at least partly

due to the lack—or presence—of one or more of these shared factors. For example, when responding to the distress of others, children who lack emotion regulation may experience frustration and aggressive outbursts in lieu of sympathy.

In terms of predictive effects, we also hypothesized that sympathy and overt aggression may have reciprocal effects on each other (e.g., Stavrinides et al., 2010). Conceptually, high or increasing levels of sympathy across development may help children anticipate the harmful consequences experienced by their victim(s) and, as a result, predict lower levels of subsequent aggressive actions (Hoffman, 2000). Alternatively, children with consistently high or escalating aggressive conduct over time may become less sensitive to the negative consequences of their actions (e.g., others' physical pain and crying), which may hinder their future level of other-oriented concern.

Although children experience sympathy and respond to it with appropriate behavior as early as toddlerhood (Eisenberg, Fabes, & Spinrad, 2006), we focused on middle childhood to early adolescence for two main reasons: First, peer relations become paramount as children enter middle childhood, enhancing the potential for aggressive social interactions that may have negative and far-reaching consequences (Rubin et al., 2011). Second, social-cognitive and social-emotional capacities become increasingly sophisticated and intertwined during this period (Eisenberg et al., 2014). These heightened capacities and relations may strengthen associations between affect and behavior, as related research has shown that links between children's self-beliefs for aggression and mother-reported aggression become more reliable in middle childhood (e.g., Davis-Kean et al., 2008). Together, these factors suggest that unearthing empirical evidence for the co-development of sympathy and aggression is particularly promising in the developmental window of middle childhood to early adolescence.

The Present Study

In terms of univariate development, we expected children's sympathy to increase or remain stable as they aged (see Eisenberg & Fabes, 1998; Eisenberg et al., 2015; Kienbaum, 2014; Lam et al., 2012; Malti et al., 2013). For overt aggression, however, we expected mean-level decreases over the course of the study (see Eisner & Malti, 2015; Tremblay, 2000, 2010). For our core hypothesis on the bivariate relation of these univariate developmental trajectories, we expected steeper intra-individual increases in sympathy to be associated with commensurate decreases in overt aggression over the same period. We then investigated the flow of effects—or temporal order—of these relations with an autoregressive cross-lagged model. As previously discussed, initially high and/or increasing aggression over time in callous disregard of others' welfare may compromise children's capacity to feel other-oriented concern—or decrease the likelihood of such feelings—thus predisposing them to more severe aggressive pathways (Frick, 2012). High levels of sympathy, instead, may enhance children's capacity to forecast the negative consequences of their actions, thereby safeguarding them from potential aggressive acts. We therefore expected bidirectional predictive effects to emerge (also see Carlo et al., 2010; Mößle et al., 2014; Stavrinides et al., 2010). Since temperamental tendencies and gender-typed socialization practices likely predispose girls to be more sympathetic than boys (Eisenberg et al., 2015; Lam et al., 2012), and boys to be more aggressive than girls (Eisner & Malti, 2015), we controlled for gender differences in the development of sympathy and overt aggression. Finally, we controlled for caregivers' occupational status as a proxy of socio-economic status (SES) because children from disadvantaged families tend to engage in more aggression (e.g., Joliffe & Farrington, 2006).

Method

Data were acquired from the first three waves of the Swiss Survey of Children and Youth (COCON). COCON is an ongoing, multi-cohort panel study of the socialization and social development of three age cohorts (i.e., 6-, 15-, and 21-year-olds) from the German- and French-speaking areas of Switzerland. In this study, we focused on the cohort of 6-year-olds, who were re-assessed at ages 9 and 12.

Switzerland has a longstanding tradition of federalism, including direct democracy, a multilingual culture with four national languages, high cultural diversity, and a stable economy. According to the Organization for Economic Co-operation and Development (OECD), it has among the highest employment rates, average household income per capita, and general life satisfaction scores (OECD, 2015). In addition, children in Switzerland enjoy good material well-being. There is, however, significant variation in civic participation and subjective well-being. Specifically, children from higher economic backgrounds are more likely to participate in community organizations and groups, and have higher life satisfaction scores than children from lower socio-economic backgrounds (OECD, 2015).

Participants

The sample was drawn in two stages. First, 131 communities—stratified by type and size—were selected. Second, participants were randomly sampled using information provided by official community registers (78% response rate). At first assessment (T1), the sample consisted of 1,273 children (49% girls; M_{age} = 6.17 years, SD = .22) and their primary caregivers. Specifically, 1,199 primary caregivers—defined as the guardian chiefly responsible for the upbringing of the child, which was the mother in 93% of cases—and 870 teachers provided valid data on children's sympathy and overt aggression. At second assessment (T2), 1,101 caregivers (92% retention rate) and 853 teachers (98% retention rate) provided such data, while 1,022

caregivers (85% retention rate) and 734 teachers (84% retention rate) reported at third assessment (T3).

Procedure

Caregivers and teachers provided written informed consent. Caregivers partook in computer-assisted personal interviews at home. All interview questions were piloted before the actual study (N = 216 6-year-olds). From T1–T3, caregivers completed questionnaires on their respective child's social and emotional development. Teachers completed similar questionnaires for each of their respective students from T1–T3 and returned them to the head research institute by post.

Measures

Children's sympathy and overt aggression were each assessed with a multi-informant approach that combined caregiver and teacher reports.[1] Specifically, we modeled sympathy and overt aggression as latent constructs using items that were content-invariant over time. At each time point, sympathy was modeled as a latent factor encompassing six items (three caregiver- and three teacher-reported), whereas aggression was modeled using nine items (three caregiver- and six teacher-reported) based on well-validated scales.

Sympathy. Caregivers and teachers rated three items (i.e., "feels sorry for others", "feels sorry for other children who are being teased", and "feels sorry for other children who are sad or upset") based on a well-validated scale (Eisenberg et al., 1996). These particular items were content-invariant across time points and informants. They were rated on a 6-point scale from 1 =

[1] Although self-reports of children's sympathy were collected, the content and rating scale of the items were altered at different time points to ensure developmental appropriateness across the study. Since this made it impossible to ensure longitudinal measurement invariance (i.e., that changes in self-reported sympathy over time reflected changes in the underlying construct of sympathy rather than differences in item content and/or scale format; Millsap, 2011), we focused on the items and scales of adult informants only.

not at all true to 6 = *always true*. Alpha reliabilities for the multi-informant measure of sympathy were .75 at T1, .80 at T2, and .78 at T3.

Overt aggression. Caregivers and teachers completed three items based on the conduct problems subscale of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; i.e., "often fights" and "has hot temper/temper tantrums") and the verbal aggression subscale of a bullying inventory (i.e., "bullies other kids verbally"; Perren & Alsaker, 2006). Teachers also rated three items taken from the Perren and Alsaker (2006) inventory (i.e., "bullies other kids physically" and "excludes other kids") and the aggressive behavior syndrome scale of the Child Behavior Checklist 6–18 (CBCL/6–18; Achenbach & Rescorla, 2001; i.e., "is disobedient"). We therefore adopted a relatively broad assessment of overt aggression. For example, we decided to use the item "has hot temper/temper tantrums" because of the significant overlap of anger dysregulation and overt aggressive behaviors in childhood and adolescence (see Eisner & Malti, 2015), as well as because this item is included in other widely-used aggression measures (e.g., the CBCL/6–18; Achenbach & Rescorla, 2001). Furthermore, all of the abovementioned items were invariant in their content across time points. They were rated on a 6-point scale from 1 = *not at all true* to 6 = *always true*. Alpha reliabilities for the multi-informant measure of overt aggression were .81 at T1, .85 at T2, and .83 at T3. For a full description of psychometric properties, see Online Appendix S2.

SES. As a proxy of SES, primary caregivers reported the current or last profession of both caregivers (when applicable), which were then translated into International Socio-Economic Index (ISEI) of occupational status scores (M = 52.20, SD = 16.83) based on an international index of ranked occupations (Ganzeboom, De Graaf, & Treiman, 1992).

Attrition and Missing Data Analysis

Retention rates were relatively high for both informants, with more than 80% of the original sample re-assessed after 6 years. We assessed patterns of missingness in SPSS 22 using Little's (1988) test for Missing Completely at Random (MCAR; i.e., missingness was unrelated to observed and unobserved variables). Although our data did not meet the strict criteria of MCAR (i.e., Little's test was significant, χ^2 (13070) = 16657.70, $p < .001$), t-tests indicated that children from families with lower SES were more likely to be missing data over time, suggesting that at least Missing at Random (MAR; i.e., missingness was related to observed variables) was supported (Enders, 2010). We therefore accounted for missing data with full information maximum-likelihood (FIML) estimation in M*plus* 7.4 (Muthén & Muthén, 2012), which produces unbiased parameter estimates under the assumption of MAR. FIML also produces more reliable estimates than traditional methods of handling missing data, such as single-imputation, even in cases of non-ignorable patterns of missingness (Enders, 2010).

Data Analytic Approach

We followed a five-step approach to comprehensively assess the relations of intra- and inter-individual changes in sympathy and overt aggression. First, in line with recommendations for modeling multi-method constructs with structurally different methods, such as caregivers versus teachers, we used the method minus one (*M*-1) approach (Eid, Geiser, & Koch, 2016; Geiser, Bishop, & Lockhart, 2015). With this approach (Figure 1), one method—or informant in our case—is chosen as the reference method and remaining methods are modeled as residual latent factors against the reference method. We selected caregivers as the reference method for sympathy because rating children's internal and therefore less observable feelings of other-oriented concern requires in-depth knowledge of their emotional lives, which caregivers—mostly mothers in our study—may be privy to as a result of more frequent emotion-based dialogues

with their children at home (Oppenheim & Koren-Karie, 2009). Conversely, we selected teachers as the reference method for overt aggression because such acts are common in school contexts and teachers likely rely on more reference points (i.e., classmates, other students) than caregivers to calibrate their assessments of children's aggression.

Second, we assessed measurement invariance (MI; i.e., the consistency with which our constructs were measured) across time to ensure the proper interpretation of our longitudinal findings (Millsap, 2011; Widaman, Ferrer, & Conger, 2010). This allowed us to attribute mean-level changes in sympathy and aggression to actual developmental processes rather than to modifications and/or differential use of our scales over time (Millsap, 2011). Since our goal was to model the mean-level development of sympathy and aggression, scalar invariance was required (Widaman et al., 2010; Online Appendix S2).

Third, we used second-order latent curve (i.e., true change) modeling (SO-LCM; Geiser, Keller, & Lockhart, 2013; Online Appendix S3) to identify the normative trajectories of caregiver- and teacher-reported sympathy and overt aggression from middle childhood to early adolescence. Methodologists have favored SO-LCM over first-order LCM because it separates measurement error and occasion- or state-specific variability (as first-order latent constructs) from true, trait-based change in a second-order latent construct, and it has greater power to detect mean-level changes because it accounts for the unreliability of manifest variables (Bollen & Curran, 2006; Geiser et al., 2013).

Fourth, we used bivariate second-order latent curve modeling (BSO-LCM) to assess the co-development of sympathy and aggression (Figure 2). A correlation between the growth factors of sympathy and aggression indicated the degree to which they co-developed over time (see Bollen & Curran, 2006; Zuffianò et al., 2014). BSO-LCM allowed us to simultaneously

model intra-individual development (i.e., mean-level changes in sympathy and overt aggression within children) and inter-individual differences in intra-individual development (e.g., if children who increased more in sympathy showed steeper decreases in aggressive behavior relative to children who increased less or decreased in sympathy).

Lastly, we explored the direction of effects between sympathy and overt aggression with an autoregressive cross-lagged model (ARC). ARC models are typically considered the most stringent test of predictive (i.e., cross-lagged) effects with longitudinal data because they control for the rank-order stability (i.e., autoregressive effects) of variables over time (Cole & Maxwell, 2003).

Results

Descriptive Statistics

The descriptive statistics of sympathy and overt aggression at each time point and their correlations are reported in the Online Supplemental Materials (see Online Appendix S1). To address the non-normality of some aggression items, we used maximum-likelihood parameter estimation with standard errors robust to non-normality (MLR) in M*plus* 7.4 (Muthén & Muthén, 2012). Sympathy and overt aggression showed moderate rank-order stability over time and were negatively correlated, both concurrently and longitudinally. Boys were rated higher in overt aggression and lower in sympathy at each time point. At T1, higher SES was associated with lower overt aggression (see Online Appendix S1).

Multi-Informant Modeling and Longitudinal MI

At each time point, we scaled latent, multi-informant factors of sympathy and overt aggression by fixing the factor loading and the intercept of their marker items to 1 and 0, respectively, and by including an additional method factor that was uncorrelated with the latent

construct of interest (Geiser et al., 2015). Analyses of MI revealed that partial scalar invariance was reached for all scales (i.e., at least one item in addition to the marker item showed metric and scalar invariance; Millsap, 2011; Widaman et al., 2010). Partial scalar invariance is usually considered sufficient grounds to assume that the factor structure of the scales remained relatively unaltered (i.e., the constructs of sympathy and overt aggression were measured in a similar manner across time; Byrne, Shavelson, & Muthén, 1989). Detailed results of MI analyses are reported in Online Appendix S2.

Developmental Trajectories of Sympathy and Overt Aggression

We ran three nested SO-LCMs to identify the best-fitting trajectories of sympathy and overt aggression. SO-LCM captures the development of a construct with two second-order latent random factors: intercept (i.e., initial status) and slope (i.e., change over time; Bollen & Curran, 2006; Geiser et al., 2013). Specifically, we tested: (a) a strict stability model assuming no mean-level change in sympathy/overt aggression from T1–T3 in which only the intercept was estimated (intercept factor loadings fixed at 1), (b) a linear change model in which a latent slope represented a linear change in sympathy/overt aggression over time (slope factor loadings fixed at 0, 1, and 2, respectively), and (c) a non-linear change model in which change was not specified *a priori* (first and last slope factor loadings fixed at 0 and 1, respectively, and second factor loading freely estimated; see Bollen & Curran, 2006). In order to establish the best fitting SO-LCM, we used the chi-square difference test ($\Delta\chi^2$) for nested models. With MLR estimation, the formula for $\Delta\chi^2$ includes the scaling correction factor (*cf*; Muthén & Muthén, 2012). A non-statistically significant $\Delta\chi^2$ indicated that the two models were statistically equivalent (Kline, 2010). Since the χ^2 statistic is sensitive to sample size, we also considered comparative-fit-index (CFI) > .90, Tucker-Lewis-index (TLI) > .90, a root-mean-square-error-of-approximation

(RMSEA) value < .08 with a 90% confidence interval (CI), and the ratio of χ^2 over degrees of freedom (χ^2/df < 2 = good fit, χ^2/df > 2 and < 5 = acceptable fit) as indicators of acceptable model fit (Kline, 2010; Marsh & Hocevar, 1985).

Sympathy. The linear change model, χ^2 (126) = 218.67 (χ^2/df = 1.74), cf = 1.09, p < .001, CFI = .98, TLI = .98, RMSEA= .02, 90% CI [.02, .03], best reproduced the development of sympathy, since it showed better fit than the strict stability model, $\Delta\chi^2$ (3) = 28.45, p < .001, and it was not statistically different from the non-linear change model, $\Delta\chi^2$ (1) = .60, p = .44.[2] As reported in Table 1, sympathy showed a very slight decline from T1–T3 (standardized mean difference = -.11). The variances of the intercept and slope were significant, indicating that initial levels of sympathy and changes in sympathy over time systematically differed between children. The intercept and slope were negatively correlated, such that higher initial values of sympathy were related to steeper declines over time. Gender (boys = 1, girls = 0) significantly predicted the intercept (β = -.23, p < .001, 95% CI [-.31, -.15]), but not the slope (β = -.06, p = .23, 95% CI [-.16, .04]) of sympathy, indicating that boys had lower initial levels of sympathy than girls, but did not differ from girls in their rate of change over time. SES did not significantly predict the intercept (β = .03, p = .40, 95% CI [-.04, .11]) or slope (β = .01, p = .90, 95% CI [-.09, .11]) of sympathy.

Overt aggression. The non-linear change model χ^2 (316) = 920.85 (χ^2/df = 2.91), cf = 1.19, p <.001, CFI = .92, TLI = .92, RMSEA= .04, 90% CI [.03, .04] showed a better fit compared to the linear model, $\Delta\chi^2$ (1) = 6.69, p = .01, which, in turn, fit better than the strict

[2] To allow model identification for the non-linear model, we fixed the residual variance of the first-order latent variable of sympathy at T3 to a very small value (i.e., .0001; Berlin, Parra, & Williams, 2013). The $\Delta\chi^2$ test was conducted by considering this constraint in both models (linear versus non-linear change).

stability model, $\Delta\chi^2$ (3) = 27.71, $p < .001$.[3] The development of aggression from T1–T3 was characterized by a general non-linear decline (standardized mean difference = -.23) and there were significant inter-individual differences around this average trajectory (i.e., the variance of the slope was significant; Table 1). The intercept and slope were negatively correlated, indicating that children with higher initial values of overt aggression showed steeper declines over time. Boys had higher initial levels of aggression than girls (β = .29, $p < .001$, 95% CI [.21, .37]), but did not differ from girls in their rate of change (β = -.03, p = .63, 95% CI [-.13, .08]). SES was not associated with the intercept (β = -.07, p = .06, 95% CI [-.14, .01]) or slope (β = .03, p = .47, 95% CI [-.06, .13]) of aggression.

Co-Development of Sympathy and Overt Aggression

After identifying the best-fitting trajectories of sympathy and overt aggression, we ran a BSO-LCM to assess the relationship between their latent slopes (i.e., their co-development). We opted for a conservative estimation of co-development by regressing the slopes on the intercepts in the BSO-LCM (i.e., by assessing change in sympathy in relation to change in aggression while controlling for inter-individual differences in initial levels of sympathy and aggression).[4]

The BSO-LCM fit moderately, χ^2 (998) = 2505.34 (χ^2/df = 2.51), cf = 1.09, $p < .001$, CFI = .91, TLI = .90, RMSEA= .04, 90% CI [.03, .04]. As reported in Table 2, there was a moderate, negative association (r = -.29) between the slopes of sympathy and overt aggression (i.e., greater increases in sympathy from T1–T3 were paralleled by greater decreases in aggression from T1–T3). The intercepts of sympathy and aggression were also negatively correlated (r = -.31),

[3] The non-linear change model was identified by fixing the residual variance of the first-order latent variable of aggression at T3 to .0001 and the $\Delta\chi^2$ test of linear versus non-linear change considered this constraint in both models.

[4] In the BSO-LCM, method factors and reference methods related to the same informant were allowed to covary (e.g., method factor for caregiver-reported aggression at T1 and caregiver-reported sympathy at T1).

indicating that children higher in sympathy at study onset started lower in overt aggression. Finally, the slopes of sympathy and aggression were negatively predicted by their respective intercepts, such that higher initial values were associated with steeper declines over time.[5]

Analysis of Temporal Order

Although ARC models do not allow for causal inferences, establishing a temporal precedence between sympathy and overt aggression, and estimating cross-lagged effects while partialling out longitudinal stability may provide us with strong evidence for the likely flow of effects between these constructs (see Cole & Maxwell, 2003). At each time point, we regressed sympathy and overt aggression on SES and gender to partial out their effects from the paths of interest. We then tested the tenability of equality constraints on unstandardized (a) autoregressive effects (e.g., the effect of sympathy at T1 on sympathy at T2 = the effect of sympathy at T2 on sympathy at T3, etc.) and (b) cross-lagged effects (e.g., the effect of sympathy at T1 on aggression at T2 = the effect of sympathy at T2 on aggression at T3, etc.). We used the $\Delta\chi^2$ test to establish the plausibility of these constraints (i.e., constrained ARC model versus unconstrained ARC model). The constrained ARC model fit the data moderately, χ^2 (975) = 2283.04 (χ^2/df = 2.34), cf = 1.09, $p < .001$, CFI = .92, TLI = .91, RMSEA= .03, 90% CI [.03, .04], and was not statistically different from the unconstrained model, $\Delta\chi^2$ (4) = 6.27, p = .18, thereby attesting to the presence of time-invariant autoregressive and cross-lagged effects. As reported in Figure 3, all autoregressive paths were significant and relatively strong (βs $\geq$ .50).

[5] We also explored if the inverse co-development was moderated by gender (boys versus girls) and/or SES (above versus below the median) by constraining the covariances between the two slopes (and the two intercepts) to be equal across groups. For both gender, χ^2 (1934) = 3428.20 (χ^2/df = 1.77), cf = 1.07, $p < .001$, CFI = .90, TLI = .90, RMSEA= .04, 90% CI [.03, .04], and SES, χ^2 (1928) = 3552.70 (χ^2/df = 1.84), cf = 1.06, $p < .001$, CFI = .90, TLI = .90, RMSEA= .04, 90% CI [.03, .04], the constrained models did not statistically differ from the unconstrained models, $\Delta\chi^2$ (2) = 4.31, p = .12, and $\Delta\chi^2$ (2) = 0.02, p = .99, respectively. The 95% CIs (based on the Fisher r-to-z transformation) for the correlations between the two slopes were: girls (r = -.35; 95% CI [-.42, -.28]), boys (r = -.21; 95% CI [-.29, -.14]), low SES (r = -.36; 95% CI [-.42, -.29]), and high SES (r = -.27; 95% CI [-.34, -.19]).

Although sympathy and overt aggression were significantly and negatively correlated at each time point, none of their cross-lagged effects were significant (*p*s > .14), indicating that children's sympathy at T1 and T2 were not predictive of their subsequent levels of aggression three years later—and vice versa. Finally, after controlling for autoregressive stability, boys had (1) lower sympathy than girls at T1 and T2 (β*s* = -.20, 95% CI [-.27, -.13], and -.11, 95% CI [-.17, -.05], all *p*s < .01), but not at T3 (β = -.07, 95% CI [-.14, .001], *p* = .06), and (2) higher aggression than girls at T1 and T2 (β*s* = .12, 95% CI [.05, .19], and .10, 95% CI [.04, .16], all *p*s < .01), but not at T3 (β = .01, 95% CI [-.06, .07], *p* = .93). SES did not significantly predict sympathy or overt aggression.

Discussion

Promoting children's sympathy has long been conceptualized as an important strategy to protect against the development of aggressive behavior across childhood (Durlak et al., 2011; Eisenberg et al., 2015; Malti et al., 2016). Yet, the extent to which children's development of sympathy is systematically related to their development of aggressive behavior still needs to be empirically identified. We aimed to fill this gap by assessing the joint, mean-level development of sympathy and aggression from middle childhood to early adolescence, a transitional period during which moral-affective responding and social behavior likely become increasingly coordinated due to more opportunities to practice social-emotional and behavioral skills with peers (Rubin et al., 2011), and advances in social-cognitive development (citations withheld for peer review; Davis-Kean et al., 2008). To bolster the robustness and generalizability of our findings, we utilized a large, representative sample of Swiss children followed over six years. Given the multi-informant nature of our data (i.e., caregiver- and teacher-reports), we modeled sympathy and aggression as latent constructs, partialling out method effects (Eid et al., 2016;

Geiser et al., 2015). We also employed advanced data analytic techniques to model the true developmental change of these constructs, including their co-development at the latent level. Since we found at least partial scalar invariance for our scales across time, we were able to interpret observed mean-level changes in sympathy and aggression across the study as reflecting meaningful developmental processes (Millsap, 2011; Widaman et al., 2010).

In line with our theorizing, we found substantial evidence for a co-developmental process linking sympathy and aggression. At age 6, children with higher levels of sympathy had lower levels of aggression (i.e., the two latent intercepts were negatively correlated) and, of particular importance, children with increasing values of sympathy from age 6 to 12 showed steeper mean-level decreases in overt aggression across the same period (i.e., the two latent slopes were negatively correlated). This co-developmental relationship was small–medium in size (Cohen, 1988) and present while controlling for inter-individual differences in sympathy and aggression at age 6, gender differences, and SES. This effect size is slightly higher than the average negative correlation (r = -.11) reported by Vachon et al. (2014) in their meta-analytic review of 86 studies investigating empathy and aggression. Several explanations may account for this difference. First, at the theoretical level, we focused on children's sympathy (a specific sub-dimension of empathy-related responding) rather than their empathy. As also noted by Vachon et al. (2014), concern for others' wellbeing, rather than the commonly assessed and mere "comprehension and vicarious experience of others' emotions" (i.e., empathy; p. 766), could be the motivational component that helps individuals refrain from committing aggressive actions. Second, we analyzed the correlation between two mean-level developmental changes (i.e., slopes) rather than the relation (cross-sectional or longitudinal) between two specific levels of empathy and aggression. Third, the Vachon et al. (2014) meta-analysis considered early adulthood as a

developmental period, whereas our focus was on the transition from middle childhood to early adolescence.

Our findings partially align with a previous meta-analysis conducted by Jollife and Farrington (2004), which reported a stronger relation between empathy and offending behaviors during adolescence (Cohen's d = -.39) compared to during adulthood (d = -.02). The current study also provides empirical support for our developmental framework emphasizing other-oriented concern as an early, developmental barrier against aggression from middle childhood to early adolescence (citation withheld for peer review; also see Hoffman, 2000) and extends it by showing the dynamic interplay of these constructs across this critical juncture. Whereas previous longitudinal studies have focused on the predictive effect of sympathy (or broader empathy-related responses) on a specific, subsequent level of aggression (e.g., Carlo et al., 2010), we documented strict interrelations between the mean-level change processes of these two constructs. This inverse developmental link likely occurs because sympathy directs children's attention and concern toward others' emotional states and well-being (Eisenberg et al., 2015; Hoffman, 2000), which may enhance their alertness to the negative consequences of aggressive acts. The numerous social-emotional and cognitive processes that jointly—albeit oppositely—affect the development of sympathy and aggression (e.g., emotion regulation, parental and peer socialization, perspective taking; Eisner & Malti, 2015; Lovett & Sheffield, 2007) may also explain their co-development. For example, regulatory deficits may be responsible for aggressive outbursts *and* lapses in sympathy. As children shift their attention inwards to manage the intense emotions they experience around aggressive acts, they may become less other-oriented and sympathetic. Future studies should explore developmental links between sympathy and aggression after controlling for the effects of these shared factors.

We also investigated the temporal order of sympathy and aggression's developmental relations. In line with our inverse co-developmental findings, sympathy and overt aggression were negatively related at each time point. However, in contrast to longitudinal findings reporting bidirectional effects between sympathy and aggression (Carlo et al., 2010; Stavrinides et al., 2010), our ARC model showed that higher sympathy in middle childhood (e.g., at 6 years of age) did not predict lower aggression later in childhood (e.g., at 9 years of age)—and vice versa. This inconsistency between our findings and those of previous studies may stem from different developmental phases studied (i.e., the transition from middle childhood to early adolescence versus within early adolescence) and methodological differences (e.g., adult informants, multi-informant approach, and longer time lags versus self reports, single method approach, and shorter time lags). Nonetheless, our lack of staggered predictive effects actually aligns with theorizing (citation withheld for peer review) that moral emotions and social behavior need to be highly coordinated across childhood to help children adapt to the evolving complexity of their social worlds (Eisenberg et al., 2015; Rubin et al., 2011). Sympathetic development limited to middle/late childhood, for example, may not be directly predictive of aggression in early adolescence because age-appropriate opportunities in early adolescence may be required for children to simultaneously practice—and thereby synchronize—their social-emotional and behavioral skills across the novel contexts of their developmental period (Rubin et al., 2011).

Part and parcel of our co-developmental analysis, we tested the normative, univariate developmental trajectories of sympathy and aggression. Although we hypothesized an increase or general stability in sympathy from middle childhood to early adolescence (see Eisenberg et al., 2015; Kienbaum, 2014; Malti et al., 2013), we identified a slight decreasing trajectory

characterized by significant inter-individual differences, as children varied considerably around this developmental trend. Theoretically, this small decline could be related to the fact that children tend to be more selective in their prosociality as they age by directing their prosocial actions (and their related other-oriented concerns) toward similar peers or people with whom they have consolidated relationships (Hay & Cook, 2007; Laible & Karahuta, 2014; Malti & Dys, in press). This is also shown by related literature on children's development of other-oriented feelings toward in- and out-group members, which indicates that young adolescents sometimes show an in-group preference, expressing less empathic concern for out-group members (see Killen & Malti, 2015). The items included in our measure of sympathy only reflected children's sympathetic concern for general targets (e.g., children who are sad or upset) rather than for specific individuals with whom they have established relationships (e.g., best friends, family members). Future studies should investigate if the development of sympathy from childhood to early adolescence differs based on the target of such concern.

Confirming previous studies with samples spanning childhood to adolescence (Eisner & Malti, 2015; Tremblay, 2000, 2010), we found a decreasing trajectory of aggression from middle childhood to early adolescence. We also identified significant inter-individual differences in the intra-individual development of aggression (e.g., some children decreased steeper than others; see Eisner & Malti, 2015 for a review). Lower rates of aggression across time have been attributed to increases in self-regulatory capacities that allow children to inhibit their disruptive emotional and behavioral responses (Tremblay, 2000, 2010), and the integration of other-oriented moral emotions and behavior into children's developing morality (Johnston & Krettenauer, 2011; Malti & Ongley, 2014).

In line with our expectations, we confirmed gender differences in both sympathy and aggression (i.e., girls showed higher levels of sympathy than boys, whereas boys showed higher levels of aggression than girls). Although temperamental characteristics can differentially predispose boys and girls toward sympathy (e.g., Eisenberg et al., 2015) and aggression (e.g., Baillargeon et al., 2007), these differences are also likely related to gender-typed socialization practices that occur at school and home. For example, being dominant and competitive are masculine-typed behaviors that are reinforced in boys early in development (Dodge et al., 2006), whereas prosocial and caring actions are frequently encouraged in girls, thereby corroborating the stereotypic view of them being naturally inclined to sympathetic feelings and less aggressive (Eisenberg et al., 2015; Grusec & Hastings, 2015).

Limitations

Several limitations and future directions of the present study should be considered. First, our data were correlational in nature and did not allow for causal conclusions (Kline, 2010). Second, our findings were derived from a specific, Western sample. Since cultural differences in moral emotions (Krettenauer & Jia, 2013) and aggression (Eisner & Malti, 2015) have been documented, future studies should assess the co-development of sympathy and aggression in different cultural contexts. Third, we focused on the developmental period of middle childhood to early adolescence, but not on the potentially fruitful transition into middle adolescence and beyond. Future research is warranted to explore if and when the co-development of sympathy and aggression remains stable, strengthens, weakens, and/or ceases altogether. Fourth, although our measure of sympathy captured its prototypical emotional component of feeling sorrow for someone else, future longitudinal studies may benefit from the inclusion of scales offering a multidimensional assessment of empathy-related responding (e.g., including empathic concern,

perspective taking, personal distress, etc.), such as the Interpersonal Reactivity Index (Davis, 1983), in order to better understand how these distinct facets differentially relate to aggression across development. Finally, we focused solely on overt aggression, whereas studies have detailed the differential correlates and development of other subtypes of aggressive behavior (for reactive versus proactive aggression, see Cui, Colasante, Malti, Ribeaud, & Eisner, 2016), some for which gender differences may manifest (e.g., physical versus relational; Crick, Ostrov, & Werner, 2006). Although these various forms are thought to co-occur and co-develop within children, they also have some distinct antecedents and consequences (Eisner & Malti, 2015; Werner & Crick, 2004), which may trigger distinct co-developmental processes with sympathy.

Conclusions

Our findings have a number of theoretical, methodological, and practical implications. Theoretically, they support the notion of simultaneous, developmental relations between sympathy and aggression from middle childhood to early adolescence. This suggests that changes in other-oriented, sympathetic tendencies are intimately linked to aggressive behavioral changes, and vice versa. A number of social-emotional and regulatory factors may underlie and facilitate the coupling of sympathy and aggression across time. Methodologically, our findings attest to the importance of considering both intra- and inter-individual change in developmental science. Although our ARC model showed that children's sympathy may not be a significant predictor of their overt aggression three years later (and vice versa), our BSO-LCM indicated a dynamic, simultaneous interplay between the changes in these constructs: children who showed more mean-level growth in sympathy from middle childhood to early adolescence also tended to be the ones who decreased more in their average level of aggressive conduct across the same period. Practically, the current investigation may inform interventions that target the promotion

of sympathy and related processes in children to prevent and decrease their aggression (Durlak et al., 2011). Given that higher sympathy earlier in childhood was not predictive of lower aggression later in childhood/early adolescence, there may not be a sensitive developmental window in which sympathy should be targeted to reduce concurrent and prospective aggressive behavior. Rather, our findings support a maintenance model of aggression prevention and intervention that involves the continuous promotion of sympathy across childhood and adolescence.

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Table 1

Estimated Parameters of the Normative Development of Sympathy and Overt Aggression

	Intercept		*Slope*		
	Mean	Variance	Mean	Variance	$I_{corr}S$
Sympathy	5.23**	.29**	-.03*	.07**	-.23*
95% CI	[5.19, 5.28]	[.27, .31]	[-.06, -.01]	[.06, .08]	[-.28, -.17]
Overt aggression	1.86**	.65**	-.17**	.55**	-.35**
95% CI	[1.79, 1.94]	[.60, .71]	[-.25, -.10]	[.51, .60]	[-.40, -.31]

Note. Estimated means, variances, and correlations ($I_{corr}S$) of latent growth factors are reported with their 95% CIs. CIs for correlation coefficients were computed based on the Fisher r-to-z transformation. Both overt aggression (n = 1257) and sympathy (n = 1251) were rated on a 6-point scale from 1 to 6. * $p < .05$, ** $p < .01$.

Table 2

Bivariate Second-Order Latent Curve Model

Sympathy with Overt Aggression		
	Coefficient (*p*-value)	95% CI
Intercept sympathy ↔ Intercept overt aggression	-.31 (*p* <.01)	[-.36, -.26]
Intercept sympathy → Slope sympathy	-.26 (*p* =.05)	[-.52, -.01]
Intercept sympathy → Slope overt aggression	.09 (*p* =.36)	[-.10, .27]
Intercept overt aggression → Slope sympathy	-.01 (*p* =.96)	[-.21, .20]
Intercept overt aggression → Slope overt aggression	-.11 (*p* =.43)	[-.39, .16]
Slope sympathy ↔ Slope overt aggression	-.29 (*p* <.01)	[-.34, -.24]
SES → Intercept sympathy	.03 (*p* =.47)	[-.05, .10]
SES → Intercept overt aggression	-.05 (*p* =.21)	[-.13, .03]
SES → Slope sympathy	.03 (*p* =.51)	[-.07, .14]
SES → Slope overt aggression	-.01 (*p* =.96)	[-.10, .09]
Gender → Intercept sympathy	-.24 (*p* <.01)	[-.32, -.15]
Gender → Intercept overt aggression	.23 (*p* <.01)	[.14, .32]
Gender → Slope sympathy	-.12 (*p* =.04)	[-.23, -.01]
Gender → Slope overt aggression	.13 (*p* =.02)	[.02, .24]

Note. Standardized betas (→) and correlation coefficients (↔) with their 95% CIs are reported. CIs for correlation coefficients were computed based on the Fisher r-to-z transformation. Variance explained (R^2): Intercept sympathy (R^2 = .06), Slope sympathy (R^2 = .07), Intercept overt aggression (R^2 = .05), Slope overt aggression (R^2 = .03).
Gender (0= girls, 1= boys); SES = socio-economic status; *n* = 1218.

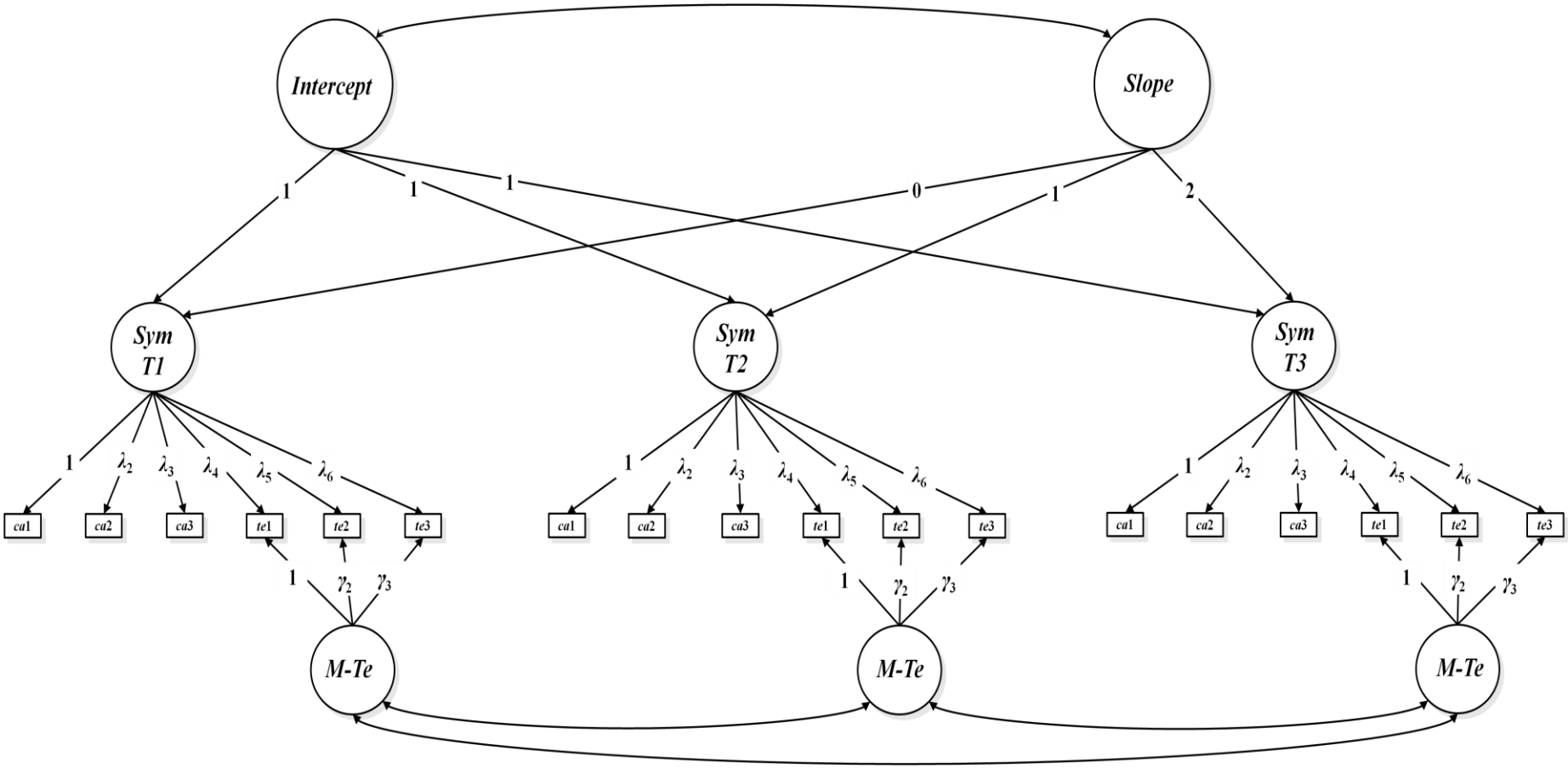

Figure 1. Univariate second-order latent curve model of sympathy (*Sym*) with *M*-1 method factor.

Note. Correlations among residual variances of the same indicator across time (e.g., item 1 of caregiver-reported sympathy at T1 with item 1 of caregiver-reported sympathy at T2) were estimated but not depicted for the sake of simplicity. Factor loadings (λ and γ) with the same subscript were constrained to equality across time. *M-Te* = teacher method factor; *ca* = caregiver-reported; *te* = teacher-reported.

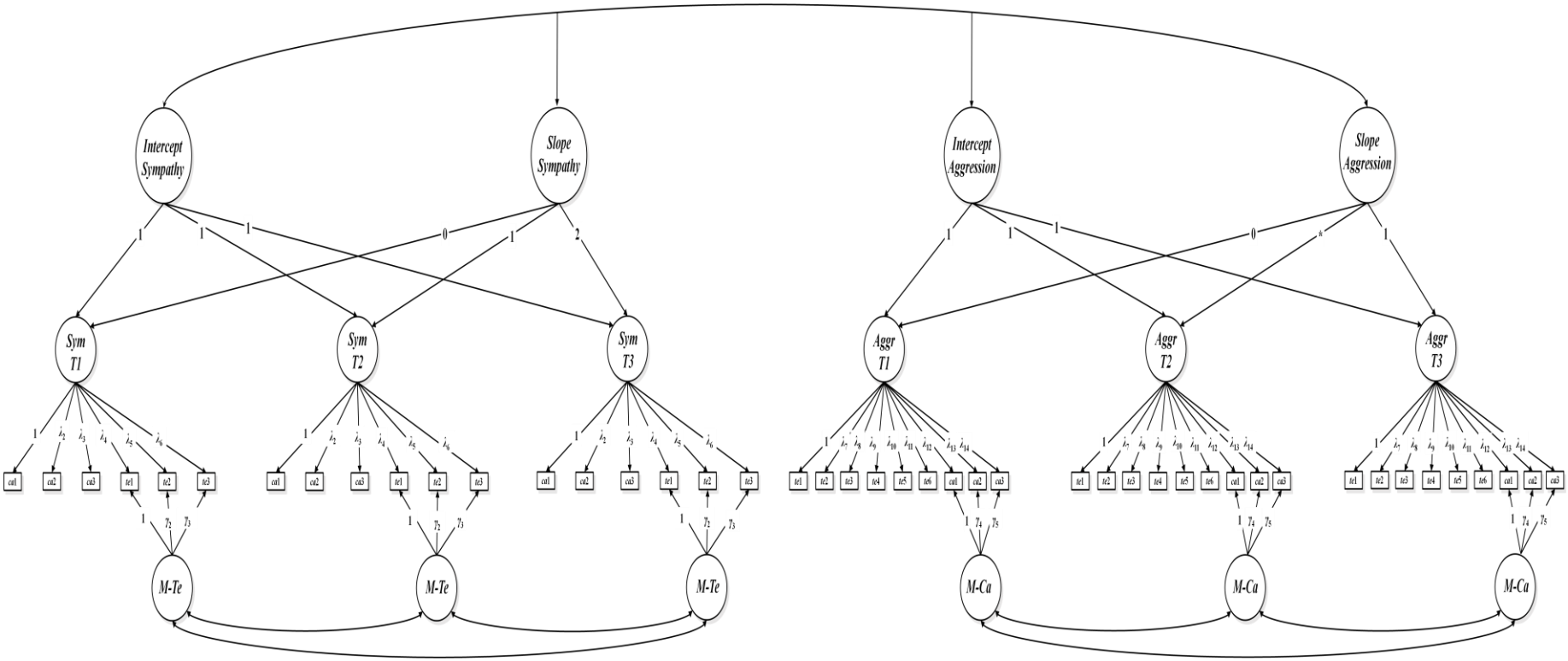

Figure 2. Bivariate second-order latent curve model of sympathy and overt aggression with *M*-1 method factor.

Note. Correlations among residual variances of the same indicator across time and among first-order latent variables were estimated but not depicted for the sake of simplicity. Factor loadings (λ and γ) with the same subscript were constrained to equality across time. *M-Te* = teacher method factor; *M-Ca* = caregiver method factor; *ca* = caregiver-reported; *te* = teacher-reported.

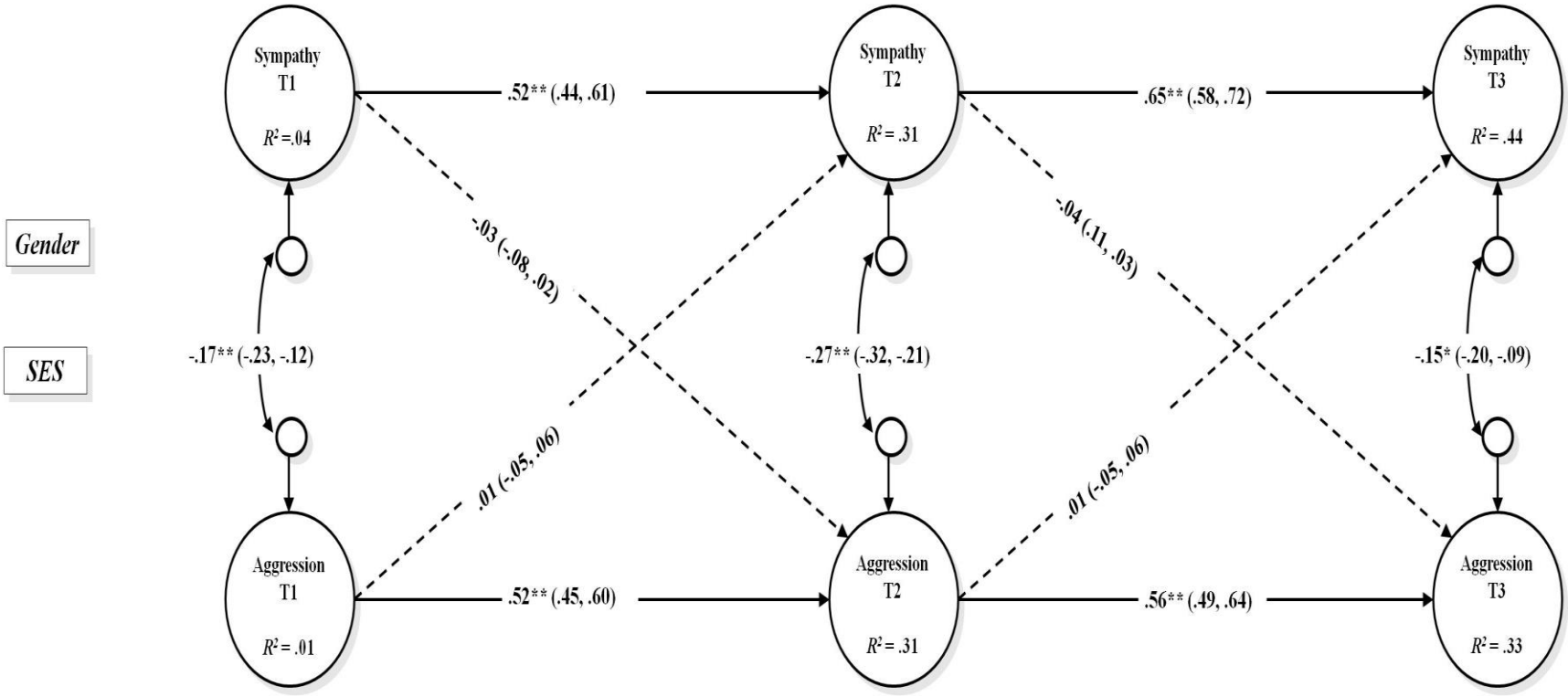

Figure 3. ARC model of sympathy and overt aggression.

Note. The effects of SES and gender, method factors, and correlations among residual variances of the same indicator across time were estimated but not depicted for the sake of simplicity. Standardized betas with their 95% CIs (in parentheses) and variance explained (R^2) are reported. CIs for correlation coefficients were computed based on the Fisher r-to-z transformation. Standardized coefficients could differ across time because the unstandardized coefficients were constrained to equality. *ca* = caregiver-reported; *te* = teacher-reported. $n = 1218$. * $p < .05$, ** $p < .01$.