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Early Childhood Predictors of Global Competence in Adolescence for Youth with Typical Development or Intellectual Disability

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Abstract

Background and Aims: We aimed to determine whether a second-order global competence latent factor could be identified as underlying relations between adolescent mental health, social skills, and academic functioning. A secondary aim was to test whether early childhood characteristics predict adolescent global competence. A final aim was to test differences in these models across youth with typical cognitive development (TD) or intellectual disability (ID).

Methods and Procedures: Participants were 246 youth with TD (n=148) or ID (n=98), with assessments from early childhood (3, 4, 5 years) and adolescence (13, 15). These youths' parents and teachers provided measures. A Multiple Indicator, Multiple Causes (MIMIC) model was tested using structural equation modeling, in which parenting, maternal depression, and emotional dysregulation in early childhood predicted adolescent global competence.

Outcomes and Results: A second-order global competence factor emerged, and was predicted by early childhood variables. The final MIMIC model demonstrated satisfactory fit. Negative parenting in early childhood predicted lower adolescent global competence for both TD and ID youth. Maternal depression predicted only for youth with ID, while emotion dysregulation predicted only for youth with TD.

Conclusions and Implications: Results have implications for longitudinal mechanisms of influence and early intervention targets for specific populations.

Keywords

competence; adolescence; early childhood; intellectual disability; parenting

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1. Introduction

Developmental researchers have reached a consensus regarding the importance of early childhood to the formation of the neurobiological, social, emotional, and cognitive foundations necessary for development (Masten, Gewirtz, & Sapienza, 2006). High-quality and comprehensive early intervention programs can improve the developmental trajectory of young children at-risk (Ramey & Ramey, 1998). However, to maximize early intervention and public policy efforts, it is essential to identify specific risk and/or protective factors with broad implications for functioning across development. These factors can serve as cost-effective intervention targets.

Early childhood factors reliably predict a multitude of child outcomes, concurrently and over time. Common constructs linked to youth outcomes, both in early childhood and through adolescence, include child cognitive and emotional capacity, parental psychopathology, and parenting behaviors (Warren & Brady, 2007). Though research testing models that span across developmental periods has been limited, longitudinal researchers have identified variables that contribute to later competence in specific domains (Masten et al., 1999). For example, maternal sensitivity in parent-child interactions before age 4 demonstrated enduring effects on both social and academic competence into adulthood (Raby, Roisman, Fraley, & Simpson, 2015). In a study of children with developmental delays, emotion dysregulation in early childhood was found to predict later social skills upon early school entry (Baker, Fenning, Crnic, Baker, & Blacher, 2007). Such studies suggest that exploring how early child and family characteristics affect child competence over longer periods of time could be a fruitful area of research, building upon putative developmental theory and meaningfully informing early intervention design.

Although research has demonstrated these effects of early childhood factors on multiple domains (e.g., maternal sensitivity relating to academic and social outcomes), the developmental mechanisms remain unclear. A specific early childhood variable may function to influence multiple outcomes, representing multifinality, through multiple mediational pathways. Conversely, an alternative explanation of the observed multifinality may be that robust early childhood predictors tap into a singular pathway or mediator, that then generates pervasive long-term effects across several domains of functioning into adolescence. Acknowledging the potency of early experiences, the resilience literature frequently draws upon composite variables across multiple outcomes to measure broad successful adaptation after early adversity (see Cicchetti, 2013 for a review).

In deriving such a composite variable, researchers have theorized regarding the fundamental domains of adaptive development. For example, Harter (1985, 1986) identified academic, social, and conduct-related functioning as dimensions of competence in middle childhood. Similarly, Masten and colleagues (1995) established that adolescent competence is multidimensional, with three primary domains of academic, social, and mental health. Unsurprisingly, these three multidimensional constructs have significant interrelations. Several studies have reported reciprocal relations between these functional domains (Welsh, Parke, Widaman, & O'Neil, 2001; Denham et al., 2003). In practice, these significant interrelations have led to recent calls for educational systems to adopt a whole child

approach that addresses emotional and physical health needs (Lewallen, Hunt, Potts-Datema, Zaza, & Giles, 2015), rather than focus solely on academic knowledge acquisition.

Therefore, it is plausible that relations between various domains of youth functioning may be explained by an underlying global factor, which characterizes positive development during a specific developmental stage. The presence of such a global factor would be theoretically consistent with the organizational model of development which posits that the primary feature of behavior is its organization with other behaviors, in specific contexts, at certain developmental stages (Sroufe, 2005). Thus, salient individual differences in competence are best characterized as differences in the organization of adaptive or maladaptive behaviors at a given developmental stage, rather than through the examination of a single outcome (Sroufe, 2005). Similar models have been confirmed in adulthood; however, the crucial domains of functioning differ from those in childhood (Hawkins, Letcher, Sanson, Smart, & Toumbourou, 2009).

To our knowledge, a parallel second-order global factor in adolescence has not yet been evaluated. Our first aim was to determine whether such a global competence latent factor could be identified. Drawing from prior research (Masten et al., 1995), the selected domains of adolescent competence in the present study reflected academic, social, and mental health functioning. If supported, this latent factor would be representative of a significant developmental process, potentially representing an underlying risk factor or a predisposition for resilience or dysfunction. Similarly, the latent factor may represent one or several mediating mechanisms (e.g., childhood depressive attribution style) through which early childhood factors exert influence on later adolescent functioning.

Further, we sought to examine whether certain early childhood predictors could be linked to such a global competence factor in adolescence. Findings could aid in identifying cost-effective, specific targets of early intervention that exert long-lasting effects on competence across domains and development. We selected three early childhood domains that have been reliably related to a multitude of child outcomes as plausible predictors of an adolescent global functioning factor: child emotion dysregulation, maternal mental health, and parenting. The selection of these domains is also supported theoretically by the transactional model, which posits that child development occurs within a transactional context, the most important of which is the parent-child interaction (Sameroff, 2009). Accordingly, the selected predictors map onto each element of that interaction: characteristics of the child (i.e., emotion regulation), characteristics of the parent (i.e., maternal mental health), and characteristics of the interaction itself (i.e., parenting). Further, the organizational model of development asserts that patterns of adaptive or maladaptive behaviors at a prior developmental stage form the foundation for patterns of competence at later stages (Yates, Egeland, & Sroufe, 2003). This suggests that adaptation in the parent-child dyad in early childhood may contribute to continuity in the organization of functional behaviors in adolescence.

1.1 Emotion Regulation

Emotion regulation (ER) is a dynamic process involving environmental, attentional, cognitive, and physiological responses, through which individuals modulate their experience

and expression of emotions (Gross, 1998). Early in life, children develop regulatory processes, including both self-soothing strategies and strategies to seek regulation assistance from others (Leerkes & Wong, 2012). Development of ER skills appears to support functioning in multiple areas in childhood and adolescence. For example, ER relates positively to standardized reading and math scores as well as student-teacher relationship quality in kindergarten (Graziano, Reavis, Keane, & Calkins, 2007). In middle school, aspects of emotionality and ER similarly related positively to student grades (Gumora & Arsenio, 2002). Individual differences in ER are also predictive of later social competence (Eisenberg et al., 2001). Conversely, ER deficits have related to lower rates of peer acceptance (Kim & Cicchetti, 2010) and higher rates of both bullying and peer victimization (Shields & Cicchetti, 2001),

In adolescence, deficits in ER are considered fundamental to the development of several forms of psychopathology (e.g., depression, anxiety, externalizing, and eating disorders; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011). Further, Murphy et al. (2004) found that adolescents with higher self-ratings of social functioning had higher regulatory abilities, both concurrently and longitudinally. Though researchers found associations in early adolescence (Gumora & Arsenio, 2002), no studies to date have examined relations between ER and academic functioning in mid-adolescence.

1.2 Maternal Depression

Parent psychopathology, specifically maternal depression, has predicted a host of adverse child outcomes. School-aged children whose mothers exhibited depressive symptoms in the child's infancy were at risk for externalizing behavior problems, social difficulties, and inattention, as well as abnormal neurological and biological markers (Ashman, Dawson, & Panagiotides, 2008). Similarly, a meta-analysis found children exposed to maternal depression earlier in development were at greater risk for psychopathology (Goodman et al., 2011). In a prospective study, maternal postnatal depression related to higher rates of clinical anxiety when children were 13 years old, while recurrent maternal depressive episodes in childhood were associated with higher rates of adolescent clinical depression (Halligan, Murray, Martins, & Cooper, 2007). Maternal depressive symptoms are also concurrently related to adolescent internalizing and externalizing symptoms in high school (Hammen & Brennan, 2003). Sequelae of such adolescent psychopathology includes increased likelihood of later academic failure (Quiroga, Janosz, Bisset, & Morin, 2013) and increased interpersonal problems (West & Newman, 2003) for youth.

1.3 Parenting

Positive parenting behaviors, such as warmth, sensitivity, and responsiveness, are associated with improved language and cognitive outcomes in early childhood (Tamis-LeMonda, Bornstein, & Baumwell, 2001) and are also a buffer in the development of child psychopathology (Chronis et al., 2007). Conversely, negative parenting behaviors (e.g., harshness) are associated with social skill deficits, higher aggressive behaviors, and deficits in ER. (Chang, Schwartz, Dodge, & McBride-Chang, 2003). Additionally, parenting characterized as over-solicitous, intrusive, or controlling is associated with poor adjustment and greater levels of child psychopathology (Degnan, Almas, & Fox, 2010;).

Further, authoritative parenting predicts better adolescent academic achievement (Steinberg, Elmen, & Mounts, 1989). Similarly, maternal sensitivity in early childhood predicted both social skills and academic achievement into mid-adolescence (Raby et al., 2015), while maternal acceptance and attachment related to better adolescent mental health outcomes (Gonzalez, Deardorff, Formoso, Barr & Barrera, 2006). Not surprisingly, negative parenting behaviors during adolescence have been associated with lower social competence, deviant youth adjustment, and poor academic achievement (Boduszek & Hyland, 2011).

1.4 Developmental Status

Consideration of individual differences in constitutional factors adds important nuance to our understanding of developmental processes. Specific populations of children are broadly at risk for poor outcomes, including children with intellectual disability (ID), a neurodevelopmental disorder in which cognitive and adaptive skills are impaired. Youth with ID have higher prevalence rates of mental health disorders, as well as impoverished social networks, even when compared to other disability groups (Einfeld, Ellis, & Emerson, 2011). Mental health difficulties may be partially explained by deficits in ER often present in children with ID (Nader-Grosbois, 2014). Further, parents of children with ID demonstrate higher levels of negative and lower levels of positive parenting behaviors when compared with parents of typically developing (TD) children (Rodas, Zeedyk, & Baker, 2016). Too, the processes linking early childhood to later youth outcomes may be magnified in risk populations. For example, children with ID are more sensitive to variability in parenting practices than TD children (Denham et al., 2000; Fenning, Baker, Baker & Crnic, 2007). It is important to determine whether the same early childhood predictors of later functioning emerge for among both typical and risk populations.

1.5 Current Study

We tested a model in which early childhood variables (ER, maternal depression, and parenting behaviors) predicted a latent variable of global functioning in adolescence in a sample of children with TD or ID. Global functioning in adolescence was comprised of academic, mental health, and social factors. The current study addressed the following research questions: 1. Are individual differences in academic, social, and mental health functioning in adolescents (i.e., youth age 13, 15) explained by an underlying global functioning latent factor? 2. If so, is variance in the adolescent global functioning factor explained by the early childhood variables of emotion regulation, maternal depressive symptoms, and positive and negative parenting behaviors? 3. Do these relations differ for youth with intellectual disability, a group with high developmental risk, relative to youth without ID?

2. Method

2.1 Participants

Participants were 246 families participating in a longitudinal study of development and psychopathology in children with or without intellectual disability (ID). Data collection occurred in two states, conducted by three universities University of California, Los Angeles, University of California, Riverside, and Pennsylvania State University. Children

were assessed yearly from ages 3 to 9, and again at ages 13 and 15. The current study utilized data from families who entered the study in early childhood, and variables used in the analyses were drawn from early childhood (i.e., child ages 3, 4, 5) and adolescence (i.e., youth ages 13, 15).

Table 1 shows the sample demographic characteristics at child age 3, by developmental status, TD (n = 148) or ID (n = 98). Children with other diagnosed developmental disabilities were included in the ID group, as long as they also met criteria for ID. Of the 98 children in the ID group, 9 children had comorbid ASD, 11 had Down Syndrome, 8 had Cerebral Palsy. Children with diagnosed developmental disabilities were excluded from the TD group (e.g., children with ASD without comorbid ID). Overall, mothers' race/ethnicity was primarily White, non-Hispanic (61.0%) or Hispanic (19.5%). The groups did not differ significantly on child gender, parent race/ethnicity, or parent age; however, families of TD children had significantly higher income than families of children with ID. Income was therefore included in analyses as a covariate. Further, there were no demographic differences between families who remained in the study through adolescence and those who did not, suggesting that data were missing at random.

2.2 Procedure

An initial home visit at child age 3 was conducted to complete informed consent, assess developmental status, and administer parent questionnaire measures. Shortly thereafter, mothers and children visited the research centers to participate in a variety of videotaped activities, including increasingly challenging puzzles, free play, and cleanup. These lab procedures were repeated at child age 4. At age 5, children were assessed with the Stanford-Binet IV (SB-IV; Thorndike, Hagen, & Sattler, 1986) while mothers were interviewed with the Vineland Adaptive Behavior Scales II (VABS-II; Sparrow, Cicchetti, & Balia, 2005). These two assessments informed diagnostic status of ID, consistent with DSM-IV criteria, for the current study. In general, children were classified as having intellectual disability if they received standardized scores less than 85 on both the SB-IV and the VABS-II, representing deficits in both intellectual functioning and adaptive behavior. Children with borderline cognitive functioning (i.e., IQ 71-84) were included in the ID group, with support from prior literature (Fenning et al., 2007). Further, in situations in which a child's SB-IV and VABS-II were discrepant (e.g., one score in the below average range, one in the average range), the score on the SB-IV determined group classification in the current study.

At ages 13 and 15, youth and families completed a variety of standardized assessments, questionnaires, interviews, and tasks in lab visits. In addition, at each adolescent assessment point, families were asked to bring a packet of questionnaires to the teacher their youth designated as knowing him/her best. Intellectual and adaptive functioning were reassessed at age 13 using the Wechsler Intelligence Scales for Children, Fourth Edition (WISC-IV; Wechsler, 2003) and VABS-II. Overall, there was very high consistency in group classification (e.g., ID, TD); though nine children (3% of the sample) changed status from age 5 to age 13 (i.e., six moved from ID to TD, three from TD to ID). Nevertheless, in the current study, age 5 classifications were used to determine group status, as theory and past research suggests that environmental influences, such as the early childhood predictors we

are measuring, can affect child trajectories– potentially resulting in shifts in abilities over time.

2.3 Measures

2.3.1 Intellectual and Adaptive Functioning.

Intellectual Functioning.: Intellectual functioning was assessed in early childhood at age 5 by the Stanford-Binet, Fourth Edition (Thorndike et al., 1986). The Stanford-Binet is a standardized assessment of cognitive ability with high internal consistency and adequate validity (Glutting, 1989). At age 13, intellectual functioning was reassessed using the WISC-IV (Wechsler, 2003). Three subtests of the WISC-IV were administered to produce a prorated Full-Scale IQ that previous research has demonstrated correlates highly with the FSIQ from the complete WISC-IV (Sattler & Dumont, 2004). Both the SB-IV and WISC-IV have means of 100, and standard deviations of 15. Scores under 85 were categorized as consistent with intellectual deficits in the current study, as discussed in section 2.2.

Adaptive Functioning.: The VABS-II (Sparrow et al., 2005) was utilized at both age 5 and age 13 to assess children's adaptive skills. The VABS-II is a semi-structured interview conducted with a parent that is used to assess adaptive skills, or skills necessary to live independently. In assessing adaptive functioning as part of the diagnostic classification at age 5 in the current study, the Adaptive Behavior Composite (ABC) score was used. The ABC has a mean of 100 and standard deviation of 15, and scores under 85 were considered below average (i.e., having adaptive deficits consistent with ID) in the current study. The VABS-II has high internal consistency and reliability (Sparrow et al., 2005).

2.3.2 Predictors.

Emotion Dysregulation.: Child emotion dysregulation was coded at age 4 using the Dysregulation Coding System (Hoffman, Crnic, & Baker, 2006). This coding system is designed to evaluate the lability (e.g., quick to upset) and regulatory (e.g., return to baseline) aspects of emotion dysregulation. Five tasks were coded for dysregulation, including three problem-solving tasks, a task in which the child had to wait to play with a special toy, and a clean-up task. Trained coders rated children in each task on a scale from 0 to 4, with higher scores indicating more dysregulation. Coding considered type, duration, and appropriateness of emotional reactions, as well as the child's ability to independently self-soothe. The Dysregulation Coding System demonstrated high reliability with an intraclass correlation of .90 (Hoffman et al., 2006). The Emotion Dysregulation subscale achieved a reliability of . 79.

Maternal Depression.

Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977).: At child age 3 years, mothers completed the CES-D, a 20-item self-report questionnaire with statements about negative affect, anhedonia, and somatic symptoms that define depression. Participants rate each item as to how often it applied to them within the last week, from 1 (*rarely*) to 4 (*most of the time*). Scores range from 0-60, with higher scores indicating greater levels of depression. The current study utilized the CES-D as a continuous variable.

Parenting.: Global ratings of both positive and negative parenting were coded using the Parent-Child Interaction Rating Scale (PCIRS) at child age 3 (Woodworth, Belsky, & Crnic, 1996). The PCIRS measures six dimensions of parenting that form two composite factors (Fenning et al., 2007): positive parenting (i.e., positive affect, sensitivity, stimulation of cognition, and detachment reverse-coded) and negative parenting (i.e., negative affect and intrusiveness). Coding teams rated videos of mother behavior on each dimension from 1 (*not at all characteristic*) to 5 (*highly characteristic*) for multiple activities (e.g., play, clean up, puzzles) for a total of 23 minutes of interaction. Because the PCIRS coding system and Dysregulation coding systems draw upon some of the same parent-child activities, a different age was used for the parenting measures (child age 3) than for dysregulation measure (child age 4) to minimize collinearity. Coders were trained to reliability, defined as reaching a criterion over 70% exact agreement and 95% agreement within one scale point of a designated criterion coder, and then coded tapes in pairs. Reliability was collected for 30% of the tapes. Kappa for inter-rater reliability was 0.71 (range = .68 – .77), which is considered acceptable (McHugh, 2012).

2.3.3 Competence Variables.—

The observed variable indicators of youth competence (i.e., social, academic, mental health) in adolescence were collected at child ages 13 and 15 through interview, self-report, and informant-report. Multiple informants, including the youth, parents, and teacher, assessed youth functioning in a variety of domains.

Vineland Adaptive Behavior Scales, Second Edition (VABS-II; Sparrow et al., 2005).: The VABS-II is described in detail above (see section 2.3.1). In addition to the overall composite ABC score, the VABS-II produces three domain scores: socialization, communication, and daily living skills. We used standardized scores from the socialization and communication domains on the VABS-II at age 13 as measures of social functioning.

Child Behavior Checklist, ages 6-18 (CBCL; Achenbach & Rescorla, 2001).: The CBCL is a measure of youth behavioral and emotional dysfunction with high internal consistency and reliability (parent report form, α=.69 to .97). The CBCL has three informant versions: the CBCL (parent report), the Youth Self Report (YSR), and Teacher Report Form (TRF). Each generates a Total Problem score, as well as several narrow band scales. The total problem and narrow band scales are scored from questions in which the informant rates a statement on a scale of 0 (*not true*) to 2 (*often true*). The CBCL also produces school competence and academic performance standardized scores. The current study utilized the standardized Total Problems, School Competence, and Academic Performance t-scores drawn from the CBCL (both mother and father report) and TRF collected at youth age 15, and the narrow band scale of Social Problems from the YSR at youth age 15.

Social and Emotional Assets and Resilience Scales, Short (12 item) Form (SEARS; Nese et al., 2012).: The SEARS is a strengths-based questionnaire that measures youth social and emotional adjustment. The parent report SEARS-P produces a total score and three subscale scores; self-regulation, social competence, and empathy. The SEARS-P short form demonstrates high convergent validity in adolescents, as well as consistency across

raters and short periods of time. We utilized the SEARS-P total score collected at age 15, with mother as the informant.

2.4 Data Analytic Plan

Structural equation modeling (SEM), using Mplus Version 7 (Muthen & Muthen, 2012), was utilized. SEM allows simultaneous evaluation of links between measured variables and latent constructs, and of associations between latent constructs themselves. We constructed a latent variable of youth *mental health difficulties* at age 5, consisting of total behavior problems t-scores on the CBCL from mother, father, and teacher report. A *social competence* factor was constructed, consisting of mother report on the SEARS, youth self-report of social problems on the YSR, and the socialization and communication domains on the VABS-II. A third latent variable of *academic competence* was constructed, utilizing school competence t-scores on the CBCL from mother, father, and teacher report. These three latent variables, and their respective observed indicators, comprised the measurement model. Further, a second-order latent factor was hypothesized to underlie these three subdomain latent factors. Measurement invariance across the TD and ID samples was evaluated using multi-group analyses in which a chi-square difference test evaluated differences in fit between different levels of metric and scalar invariance across the first- and secord-order factor levels (Chen, Sousa, & West, 2005). Specifically, in the first such test, a configural invariant model (i.e., allowing all factor loadings to vary by developmental group) was compared to a nested model in which first-order factor loadings are constrained to be invariant across groups. If there is no significant difference in these models, the first-order factor loadings are considered invariant and can be then be used as a comparison model to a third model in which the second-order factor loadings are also held invariant across TD and ID groups. If both first- and second-order factor loadings are invariant across groups, this suggests that the hypothesized latent factors, including the second-order global competence factor, are being represented similarly across groups. This measurement invariance is necessary prior to comparing the influence of causal indicators on latent factors.

Scalar invariance will also be tested for using similar methodology (Chen et al, 2005). However, it is not expected that our data will achieve scalar invariance, as this would require the TD and ID groups to have statistically equivalent means across all indicator variables. Such invariance is unlikely given that youth with ID are at significantly higher risk for behavior, mental health, social, and academic problems. However, scalar invariance is necessary when comparing factor means, which the current study does not aim to do. Thus, establishment of measurement invariance alone would be sufficient to proceed.

Next, the hypothesized Multiple Indicator, Multiple Causes (MIMIC) model was tested. The focus of these analyses was to test the fit of a MIMIC model that included causal indicator paths in which early childhood emotion dysregulation, mother depression, positive parenting, and negative parenting predicted adolescent global competence. The strength and statistical significance of each pathway was estimated. Maximum likelihood estimation with robust standard errors (MLR) was used to estimate chi-square test statistics, which are robust to nonnormality. Full information maximum likelihood (FIML) estimation was used to account for missing data; FIML has been demonstrated to be a robust estimator (Enders &

Bandalos, 2001; Yuan, Yang-Wallentin, & Bender, 2012). Three criteria were used to evaluate the models: the likelihood chi-square test, the Comparative Fit Index (CFI), and the root mean square error of approximation (RMSEA). In SEM, a non-significant chi-square indicates that the data match the model. Guidelines for CFI suggest that values greater than 0.90 and 0.95 are indicative of acceptable and excellent fit, respectively (Bentler & Bonett, 1980; Hu & Bentler, 1999). RMSEA values under .08 suggest good model fit (MacCallum, Browne, & Sugawara, 1996).

3. Results

The intercorrelations among all of the variables entered into each of the models are presented in Table 2. Each adolescent competence variable was significantly correlated with other competence variables within the same domain, supporting the presence of the hypothesized first-order domain specific latent variables. Further, each of the domain latent factors of mental health, social, and academic function were significantly inter-correlated, providing initial justification to test for the presence of a global competence factor underlying all three domains.

Children with ID exhibited significantly higher levels of emotion dysregulation ($M = 6.10$, $SD = 4.5$) than TD children ($M = 3.10$, $SD = 2.9$), $t(203) = 5.74$, $p < .001$, Cohen's $d = 0.79$. On average, parents of children with ID exhibited significantly more negative parenting behaviors ($M = 1.08$, $SD = 1.8$) than parents of TD children ($M = -0.64$, $SD = 1.5$), $t(230) = 7.75$, $p < .001$, Cohen's $d = 1.04$. Moreover, parents of ID children utilized significantly less positive parenting behaviors ($M = -1.04$, $SD = 3.1$) than parents of children with TD ($M = 0.62$, $SD = 3.1$), $t(230) = 3.90$, $p < .001$, Cohen's $d = 0.53$. There was no TD/ID difference in maternal depressive symptoms at child age 3 (TD: $M = 9.78$, $SD = 9.1$; ID: $M = 10.84$, $SD = 8.8$), $t(232) = -0.87$, $p > .05$, Cohen's $d = 0.12$.

3.1 Measurement Model

The configural measurement model of adolescent functioning, comprised of three latent variables (i.e., mental health, social, academic), was evaluated for fit in both groups utilizing multigroup analysis. All first- and second-factor loading paths were freely estimated for TD and ID, separately. The configural model (Model 1) satisfied all three fit criteria: $\chi^2(64) = 64.37$, $p = .463$; CFI = .99; RMSEA = .010, thus supporting the presence of the three proposed latent factors of domain-specific adolescent functioning and of a second-order latent factor of global functioning. To test for measurement invariance, the configural measurement model (Model 1) was compared to a nested model in which first-order factor loadings were constrained to be equal across both groups (Model 2; Satorra & Bender, 2010). Results suggested that the first-order latent factors representing mental health, social, and academic functioning were measured similarly across TD and ID youth, with no significant difference in fit across Model 1 and 2, $\chi^2(7) = 4.21$, $p = .755$. The model (Model 2), in which first-order factor loadings were constrained to be equal across both groups, also met all three fit criteria.

Next, invariance of the second-order factor loadings was tested. Given the confirmation of first-order factor loading invariance, Model 2, in which first-order factor loadings were

constrained to be equal across groups while structural paths (i.e., relations between first- and second-order latent factors) were freely estimated across groups, was used as the comparison model. This less restrictive model was compared to a model in which second-order factor loadings were also constrained to be equal across TD and ID groups (Model 3). A chi-square difference test was nonsignificant, $\chi^2(2) = 0.37$, $p = .831$, supporting that second-order structural paths were statistically equivalent across TD and ID groups. Thus, measurement invariance across both first- and second-order factor loadings was established. Model 3 was then compared to a model in which all factor loadings as well as intercepts of measured indicators were constrained to be equal (Model 4). As expected (see Data Analytic Plan), this fourth model, which represents first-order scalar invariance, had significantly worse fit across indices, and failed the chi-square difference test, $\chi^2(7) = 20.68$, $p = .004$. Thus, Model 3 was used in all following analyses; this model is shown in Figure 1. This final measurement model demonstrated excellent fit: $\chi^2(73) = 69.68$, $p = .589$; CFI = 1.00; RMSEA = .00. All first- and second-order factor loadings in Model 3 were highly significant, with the absolute values of standardized coefficients for the second order factor ranging from .662 to .890.

3.3 MIMIC Model

The fit of the hypothesized MIMIC model, as seen in Figure 2, was then evaluated. The MIMIC model included paths from the hypothesized four causal indicators (i.e., child emotion dysregulation, maternal depression, negative parenting, positive parenting) to the global competence factor. In testing the MIMIC model, the measurement and structural components of the model were constrained to be equal across groups, while the path estimates from the selected causal indicators were allowed to differ by developmental status group. Family income was included as a covariate. As family income was not a variable of interest, an initial Wald test was conducted to determine whether the path from income to global competence differed by group. No group differences were revealed, $p = .55$, indicating that early childhood family income related to later functioning in adolescence similarly for both TD and ID youth. In subsequent models, the path for family income was constrained to be equal across groups.

Sequential model adjustment was utilized to improve the model (Yoon & Kim, 2014). Positive parenting was removed from the model as its predictor path did not approach significance for either group. The subsequent model, including emotion dysregulation, maternal depression, negative parenting, and family income as causal indicators, satisfied the three fit criteria, $\chi^2(146) = 153.94$, $p = .310$; CFI = .978; RMSEA = .021, with excellent fit.

Wald tests were used to test for significant differences in the paths of causal indicators between groups. No significant differences were observed in the explanatory power of negative parenting in predicting the global competence factor, $p = .851$, suggesting that these processes operate similarly across developmental status. Thus, in the final model, this path was constrained to be equal across the TD and ID groups to maximize estimation power. In contrast, group differences in the causal indicator paths were significant for maternal depression, $p = .043$; thus this path was allowed to vary in the final model by developmental group. Finally, for emotion dysregulation, the Wald test approached significant, $p = .070$. In

light of the current small sample size and possible power limitations in detecting differences, this path was also allowed to vary by group in the final model, utilizing a more conservative approach to model estimation. This final model similarly demonstrated excellent fit, $\chi^2(148) = 153.95$, $p = .352$; CFI = .984; RMSEA = .018.

Figure 3 focuses in on the portion of the model including the causal indicators and provides the path coefficients for both the TD and ID groups for comparison. For TD youth, path coefficients revealed that higher levels of emotion dysregulation in early childhood inversely predicted later adolescent global competence, $\beta = -0.29$, $p = .024$ (B = 0.11, $p = .040$), over and above the effects of maternal depression, negative parenting, and family income. Higher rates of negative parenting behaviors were similarly significantly associated with lower global adolescent competence, $\beta = -0.24$, $p = .041$ (B = −0.18, $p = .047$), over and above other causal indicators. Neither maternal depression nor family income were significantly associated with adolescent global competence for TD children. For TD youth, the combined contributions of the three predictors and family income explained 21.8% of the variance in the adolescent global functioning factor.

For children with ID, the path coefficient for negative parenting was also significant and negative, $\beta = -0.28$, $p = .046$ (B = −0.18, $p = .047$), as the path was held constant. Emotion dysregulation showed no significant relation with later competence for youth with ID, in contrast to the findings for youth with TD. However, maternal depressive symptoms at child age 3 did significantly explain variance in adolescent global competence for this group, $\beta = -0.36$, $p = .009$ (B =−0.05, $p = .022$). The negative association suggests that as number of endorsed maternal depressive symptoms increased, adolescent global competence declined for youth with ID. As with TD youth, family income was non-significant. For youth with ID, the combined contributions of the causal indicators explained 30.2% of the variance in the global competence factor.

4. Discussion

We sought to identify whether a global functioning latent factor in adolescence would emerge, representing a common pathway through which mental health, social, and academic functioning were interrelated. A secondary aim was to determine whether this adolescent factor could be predicted by early childhood factors. These relations were examined across both youth with typical development (TD) and youth with intellectual disability (ID).

Each first-order factor, representing domain-specific functioning, loaded strongly onto the adolescent global competence latent variable, suggesting that individual variability in these three essential domains (i.e., mental health, social, and academic) is partially explained by a common factor. These findings are consistent with, and expand upon, prior literature establishing the core competency domains in adolescence as mental health, social, and academic functioning (Masten et al., 1995). The presence of this latent competence variable may suggest an underlying mechanism through which detrimental and protective factors operate on functioning. Further, results supported model invariance in factor loadings and structural paths across both typically developing (TD) youth and youth with intellectual disability (ID). This invariance supports the notion that the components of youth functioning

operate and relate to each other similarly, regardless of developmental status, and that the structure of global competence is cohesive across a notably diverse group of adolescents.

We addressed early childhood predictors of adolescent global functioning. For TD children, two domains from early childhood (negative parenting, emotion dysregulation) emerged as significant predictors of global functioning in adolescence. Higher rates of both were associated with subsequent lower levels of adolescent competence. Although the TD group had, on average, lower and less variability in dysregulation scores than the ID group, individual differences in capacity to manage emotions were still predictive of later outcomes.

Further, emotion dysregulation was not a significant predictor for the ID sample. Given that ID is associated with behavioral differences at the person level, including higher dysregulation, it is possible that variability in these areas does not exert influence on outcomes over and above the influence associated with the developmental risk of having ID. Maternal depressive symptoms at child age 3, however, were significantly associated with lower adolescent competence in youth with ID, controlling for family income. This finding was not explained by baseline differences in average maternal depressive symptoms in the two groups, suggesting that children with ID may be especially sensitive to variability in maternal mental health. Combined with the finding that negative parenting was also associated with reductions in their adolescent functioning, these results suggest that children with ID may be particularly impacted by their external environments (e.g., family system) rather than person-level characteristics (e.g., regulatory skills). This is consistent with prior literature that environmental factors, such as parenting, are more influential for youth populations with high developmental risk (e.g., Denham et al., 2000).

Unexpectedly, positive parenting was not a significant predictor for either child group, and model fit improved when it was removed from the model. It is possible our measure of positive parenting did not capture the construct's full complexity. For example, our positive parenting composite did not include dimensions related to having high expectations or setting clear limits. It is also plausible that the predictive power of negative interactions is simply more powerful than that of positive interactions.

4.1 Limitations and Future Directions

We utilized longitudinal data collected from multiple methods (i.e., behavioral coding, interview, and questionnaire) and multiple informants (i.e., mother, father, youth, teacher), across multiple periods of child development. Although these elements support the robust nature of these findings, there are limitations to consider, most notably the moderate sample size (N=246) given the complexity of the model. Further, the current analyses cannot elucidate the nature of the shared variance underlying mental health, social, and academic functioning. This shared variance, as seen in the global competence second-order factor, may represent any number of developmental mechanisms or mediating factors. Similarly, results cannot disentangle whether early childhood is singularly important, or merely indicative of a child's or family's trajectory, a possible area of future research. Thus, future research could aim to detect whether changes in the identified predictor variables (e.g., improvements in maternal depression via intervention in childhood) results in corresponding

improvements in adolescent competence. Future directions would also include identifying additional causal indicators and testing this model within other high-risk populations.

4.2 Implications

Despite limitations, the presence of a global competence factor in adolescence has important implications for our understanding of risk and treatment during this critical developmental period. Given the underlying relations among multiple domains of functioning, the onset of difficulties in one area (e.g., peer conflict at start of high school) may be seen as a strong risk factor for future difficulties in the other areas of functioning (e.g., mental health needs, academic failure). Results reinforce need for increased utilization of a whole-child approach to assessment and treatment, an approach that could be adapted by service providers, parents, and school professionals.

This model further suggests that all children could benefit from services to reduce the incidence of negative parenting behaviors, such as negative affect and intrusiveness. Incorporating a family component in preschool or kindergarten curricula that focuses on reducing negative parenting may yield considerable benefits. Evidence suggests that this approach is feasible, as parents are able to learn and implement techniques taught to them in therapeutic parent training models (Kaminski, Valle, Filene, & Boyle, 2008).

Results also indicate that early emotion regulation skills are an essential predictor of later competence in TD children. Indeed, research has shown positive benefits following the incorporation of social-emotional curricula in school settings, including enhanced emotional understanding, interpersonal problem-solving ability, and inhibitory control (Domitrovich, Cortes, & Greenberg, 2007). With accumulating evidence connecting mindfulness to improved emotion regulation in adults (Arch & Craske, 2006; Hill & Updegraff, 2012), mindfulness may also be an effective avenue to pursue in children. The limited research conducted on this topic has preliminarily demonstrated the feasibility and efficacy of teaching contemplative practices (e.g., meditation, mindfulness, yoga) to children (Burke, 2010; Greenberg & Harris, 2012).

With respect to children with ID, both negative parenting and maternal depressive symptoms were significant predictors of later youth functioning. These results suggest need for early intervention models to increase the focus on caregivers. In particular, parents' individual mental health screenings and services may have meaningful benefits for children with neurodevelopmental disorders, over and above more common child-focused and dyadic services. To increase feasibility, it may be beneficial to incorporate parent services (e.g., individual mental health therapy, psychoeducational and/or support groups) into the centers and programs serving children. These findings are especially important since parents of children with developmental delays are more likely to experience high levels of stress (Baker, Blacher, Crnic, & Edelbrock, 2002; Lee, 2013) and depression (Olsson & Hwang, 2001). Our findings, and associated implications, are in line with accumulating evidence supporting a developmental systems approach towards intervention for children with ID and other developmental delays that addresses parenting skills and caregiver stress in addition to direct services with the child (Crnic, Neece, McIntyre, Blacher, & Baker, 2017).

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What This Paper Adds

This paper uses structural equation modeling to test whether global competence can be statistically measured in adolescence, expanding upon previous use of composite measures, and then predicted from early childhood, identifying cost-effective and powerful intervention targets. The model was tested in youth with typical development (TD) and in youth with intellectual disability (ID) to explore the universality and specificity of these processes. Results indicate that there is indeed shared variance underlying academic, mental health, and social functioning in adolescence, and that such relations are strong enough to support the conclusion that these domains represent pieces of a singular latent factor characterizing adolescent global competence. This paper further demonstrated that each domain factor and the global factor itself are measured similarly for both TD and ID adolescents, suggesting that the construct of competence is functionally similar in both populations. Negative parenting behavior was a significant predictor for both groups, while emotional dysregulation and maternal depressive symptoms showed specificity in impact, emerging as significant for only one group. Findings are consistent with previous literature, reinforcing the foundational nature of early childhood on later development and the interconnectedness of functional domains. Beyond this, results suggest that intervening on the identified predictors has the potential for broad positive effects over time, but also underscore the need for targeted programs for specific populations.

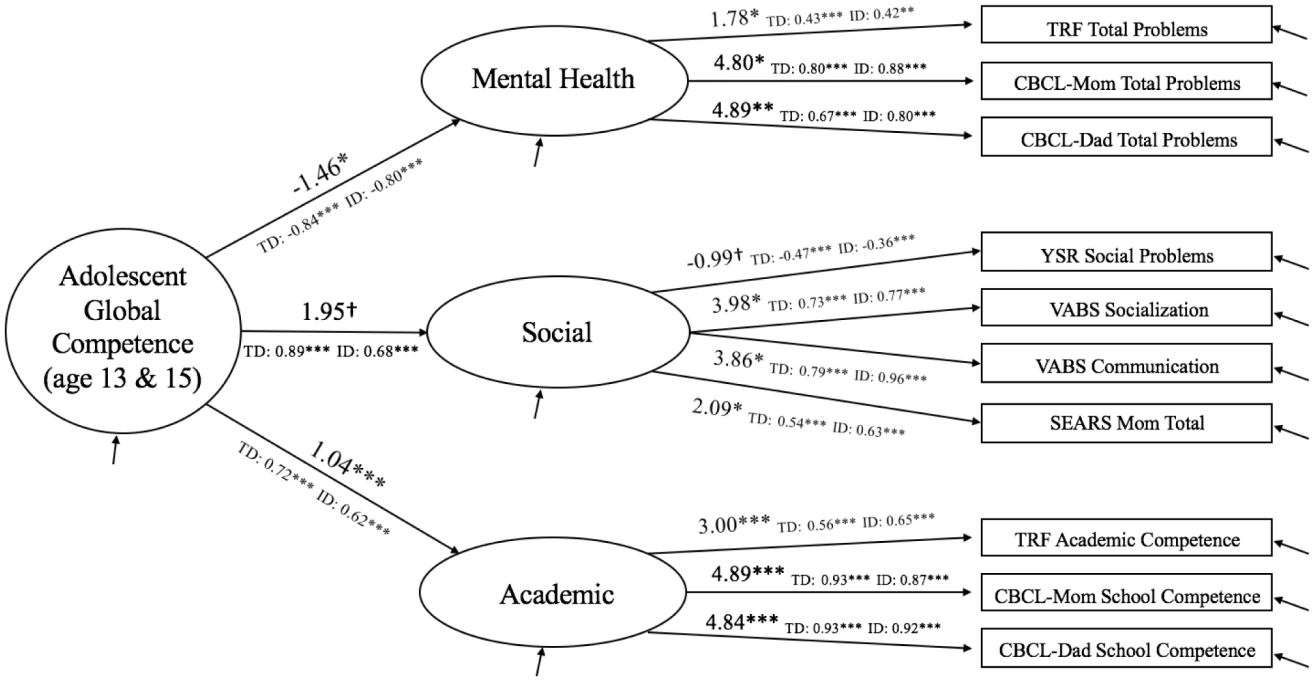

Figure 1.

Final measurement model in which an adolescent global competence second-order latent factor emerged. Measurement invariance was supported across developmental status groups (i.e., TD, ID) at both the first-order and second-order levels. Unstandardized path coefficients are shown above, with standardized coefficients provided in subscripts for ease of interpretation. *Notes*. *p<.05, **p<.01, ***p<.001

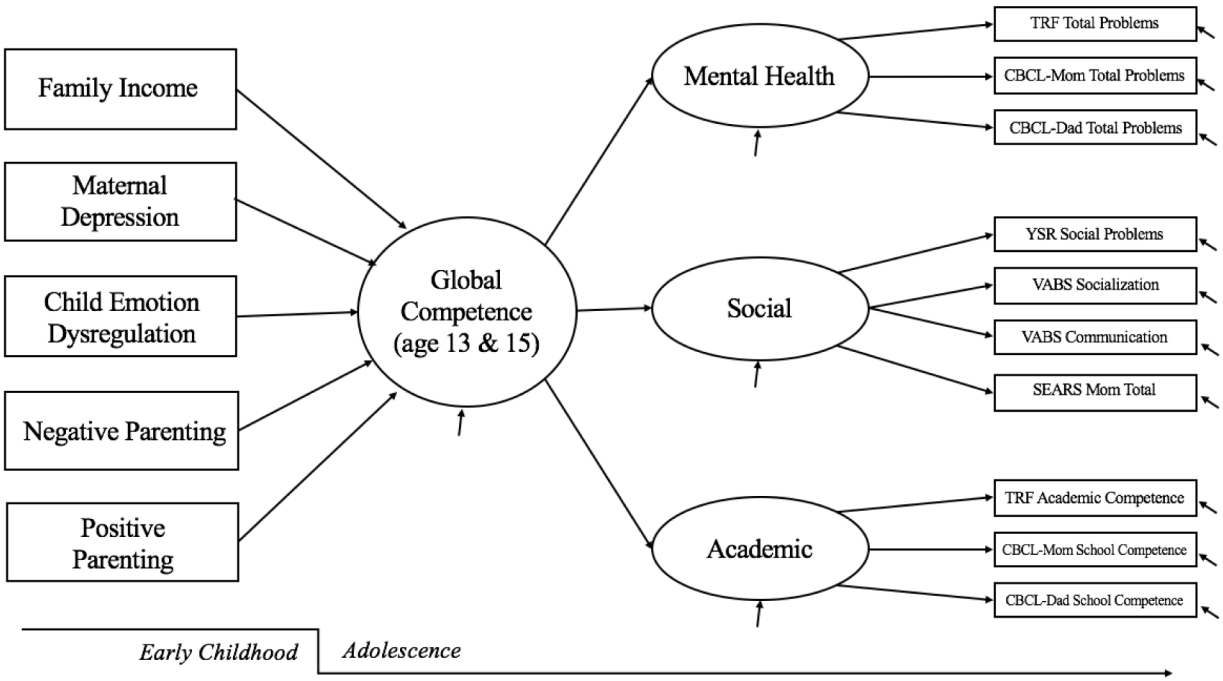

Figure 2.

Complete hypothesized MIMIC model, with inclusion of four early childhood (age 3 and 4) causal predictors and one covariate, family income.

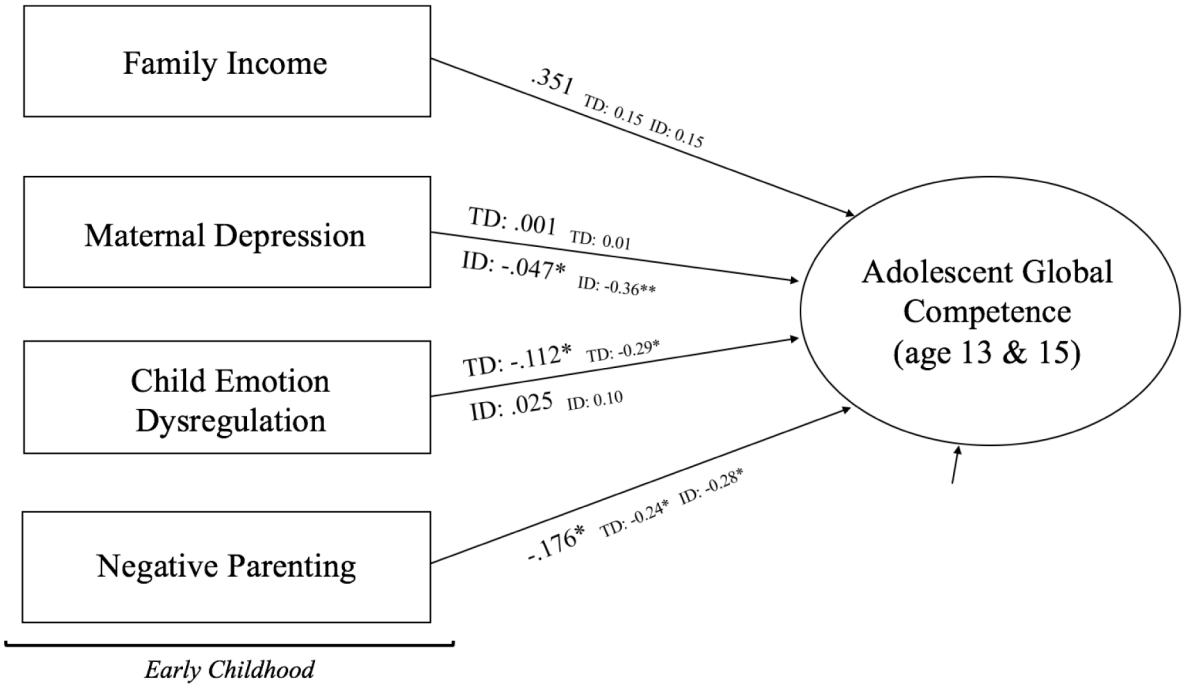

Figure 3.

Unstandardized path coefficients for all covariates and early childhood predictors of global competence factor included in final model. Standardized coefficients provided in subscripts for ease of interpretation. When not denoted, there was no significant difference in path coefficient between groups and path coefficients were held constant. The remaining components of the model (i.e., first-order latent factors and observed effect indicators) are not shown for clarity of visual presentation. *Notes*. TD: typically developing children; ID: children with intellectual disability. *$p < .05$, **$p < .01$, ***$p < .001$

Table 1

Demographics by Developmental Status Group

Demographic	TD	ID	χ^2 or *t*
Child gender (% male)	56.1	59.8	$\chi^2(1) = 0.31$
Child race (% White, non-hispanic)	60.8	60.9	$\chi^2(1) = 0.00$
Family income (% > $50K) – age 3	59.5	40.2	$\chi^2(1) = 8.12^{**}$
Mother's age (years) – age 3	34.14	32.66	$t(233)=1.87$
SB-IV – age 5	103.47 (11.39)	60.58 (15.61)	$t(225)=23.84^{***}$
VABS-II ABC – age 5	104.33 (15.70)	66.33 (14.45)	$t(225)=18.23^{***}$
WISC-IV Estimated FSIQ – age 13	108.40 (13.50)	66.11 (16.75)	$t(106)=58.39^{***}$
VABS-II ABC – age 13	95.78 (10.31)	75.35 (12.90)	$t(119)=9.53^{***}$

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

Table 2

Bivariate Correlations among variables included in tested models. Mental health, social, and academic variables were collected in adolescence, at either age 13 or 15.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Covariate	1. Family Income	1														
Early Childhood Predictors	2. Emotion Dysregulation	−.04	1													
	3. Positive Parenting	.23**	−.22**	1												
	4. Negative Parenting	−.23**	.29**	−.48**	1											
	5. Maternal Depression (CES-D)	−.23**	.18**	−.20**	.21**	1										
Mental Health Function	6. TRF Total Problems	.41**	.28*	−.32**	.45**	.15	1									
	7. CBCL Mom Total Problems	.25**	.23*	−.14	.31**	.16	.46**	1								
	8. CBCL Dad Total Problems	.15	.22*	−.14	.18	.12	.43**	.63**	1							
Social Function	9. YSR Social Problems	.23**	.16	.01	.22*	.15	.41**	.34**	.25*	1						
	10. VABS Socialization	−.21*	−.31**	.14	−.42**	−.31**	−.47**	−.45**	−.38**	−.28**	1					
	11. VABS Communication	−.24*	−.38**	.27**	−.47**	−.35**	−.54**	−.50**	−.48**	−.41**	.77**	1				
	12. SEARS Mom Total	−.29**	−.18	.16	−.34**	−.13	−.40**	−.54**	−.45**	−.30**	.57**	.57**	1			
Academic Function	13.TRF Academic Performance	−.37**	−.29*	.40**	−.44**	−.19	−.64**	−.49**	−.41**	−.40**	.60**	.63**	.47**	1		
	14. CBCL Mom School Competence	−.20*	−.31**	.12	−.43**	−.18	−.52**	.55**	−.43**	−.44**	.58**	.61**	.46**	.73**	1	
	15. CBCL Dad School Competence	−.17	−.32**	.24*	.47**	−.23*	−.52**	−.54**	−.44**	−.39**	.53**	.58**	.45**	.70**	.88**	1

Notes. *p<.05, **p<.01.