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Testing a Dual Cascade Model Linking Competence and Symptoms Over 20 Years from Childhood to Adulthood

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This study examined the unique longitudinal effects linking academic competence, social competence, and internalizing symptoms from childhood to adulthood. A multimethod and multi-informant approach was used to assess psychopathology and competence in 205 participants during four developmental periods. Social competence in childhood had a cascading effect on internalizing symptoms in adolescence, whereas social and academic competence in emerging adulthood had dual cascading effects on internalizing in young adulthood. Results suggested a developmental cascade beginning with externalizing symptoms in childhood, which contributed to lower academic achievement in adolescence, which in turn influenced social competence in emerging adulthood and internalizing symptoms in young adulthood.

Developmental theory and extant longitudinal data suggest that distinct domains of adaptive functioning may be meaningfully interrelated over long periods, with problems in one domain spreading to affect later development through various pathways, a phenomenon described in terms of transactional effects, snowball effects, cascade effects, chain reactions, and indirect and mediated effects (Masten, Burt, & Coatsworth, 2006; Rutter, Kim-Cohen, & Maughan, 2006).

However, few studies to date have tested models of such effects with informative designs, particularly across different developmental periods (Burt, Obradović, Long, & Masten, 2008; Masten et al., 2005; Mesman, Bongers, & Koot, 2001). Better delineation of the directions, timing, and processes involved in such effects has important implications for intervention as well as developmental theory. Study of directional effects over and above the covariance of multiple domains within time and the interindividual stability of multiple domains across time may reveal unique processes underlying developmental stability in adaptation, as well as the best targets and timing for intervention (Masten et al., 2006). The present study was designed to examine cascade effects linking academic competence, social competence, and internalizing behavior problems across 2 decades spanning childhood to adulthood.

Developmental scientists long have posited that academic and social competence play central roles in the development of internalizing symptoms of anxiety, depressed mood, and low self-esteem. Patterson and
colleagues hypothesized that disruptive, aggressive behavior contributed to failure in two key domains of competence when children entered school, resulting in dual failure that in turn contributed to depressed mood in preadolescent boys at risk for psychopathology (Patterson & Capaldi, 1990; Patterson, Reid, & Dishion, 1992). Using structural equation modeling, Patterson and Stoolmiller (1991) tested the dual failure model by examining whether academic failure and peer rejection jointly contribute to depressed mood in three samples of boys. Current peer relations and academic competence covaried, yet each was independently related to depressive symptoms. Cole (1990, 1991) reported a cumulative effect of incompetence across multiple domains of functioning on depressive symptoms. For example, academically and socially incompetent fourth graders had higher levels of depressive symptoms than children who were incompetent in only one domain, who in turn had higher levels of symptoms than children competent in both domains. Moreover, academic competence was related to depressive symptoms, controlling for social competence, and vice versa (Cole, 1990).

Longitudinal studies have corroborated the predictive significance of academic and social competence for future internalizing problems (which include symptoms of depression as well as anxiety and somatic complaints) over and above prior levels of such symptoms. Academic competence was related to declines in depressive symptoms and emotional distress across elementary school years (Herman, Lambert, Ialongo, & Ostrander, 2007; Roeser, Eccles, & Sameroff, 2000). Similarly, broad indices of social competence such as social problems, peer status, and sociability predicted stability in internalizing symptoms across childhood and adolescence with lower social competence forecasting increases in symptoms (Chen, Li, Li, & Liu, 2000; Kiesner, 2002; Mesman et al., 2001). Furthermore, studies indicate that longitudinal decline in academic and social competence predicted higher levels of current internalizing symptoms (Chen, Rubin, & Li, 1995; Cole, Martin, & Powers, 1997; Kellam, Rebok, Mayer, Ialongo, & Kalodner, 1994).

Few of these longitudinal studies controlled for interindividual longitudinal stability and within-time covariation of competence as well as psychopathology, which would provide the strongest test for transactional or cascade effects. In one study of sixth graders, Cole, Martin, Powers, and Truglio (1996) found that only social competence predicted depressive symptoms 6 months later, controlling for within-time covariation of competence and symptoms and the high stability of each domain. Like most extant studies, Cole et al. (1996) studied stability over brief time spans. Recent data suggest that there may be long-term cross-domain effects. Masten and colleagues (2005) observed that academic competence in emerging adulthood predicts young adult’s internalizing symptoms 10 years later. Further, they reported that social competence in childhood predicts internalizing symptoms in adolescence and that social competence in emerging adulthood predicts internalizing symptoms in young adulthood (Burt et al., 2008).

These recent studies represent unique efforts to examine linkages among domains of competence and psychopathology across multiple developmental periods, including emerging and young adulthood. However, to our knowledge, no study has examined the joint longitudinal effects of both academic and social competence on internalizing symptoms over time, particularly beyond adolescence. Thus, Patterson’s dual failure model still remains largely untested in longitudinal designs extending past childhood.

Academic and social competence are two of the most important developmental task domains during the school years of childhood and adolescence (Masten et al., 2006; Obradović, van Dulmen, Yates, Carlson, & Egeland, 2006). Social skills, friendship quality, peer acceptance, and peer group values have been associated with academic achievement and school success, both concurrently and predictively across time (Chen, Rubin, & Li, 1997; Ladd, Birch, & Buhs, 1999; Malecky & Elliott, 2002; Masten et al., 1995; O’Neil, Welsh, Parke, Wang, & Strand, 1997; Wentzel & Caldwell, 1997). Conversely, academic achievement has been shown to improve social competence, peer acceptance, and related constructs of sociability and leadership over time (Chen et al., 1997; Coie & Krehbiel, 1984). In a rare study of transactional effects, Welsh, Parke, Wideman, and O’Neil (2001) examined the interplay between academic and social competence controlling for interindividual stability of competence. They reported cross-lagged effects between academic competence and positive and negative indices of social competence across the first three grades of elementary school. It is important to extend this line of research into later childhood, adolescence, and emerging adulthood because successful achievement of academic and social competence significantly contributes to adaptation during these developmental periods and can have lasting effects on longitudinal patterns of functioning.

Several studies also reveal alternate pathways from internalizing symptoms to academic and social competence, suggesting that internalizing symptoms may undermine competence. Indices of depressive symptoms and emotional distress have been found to predict
short-term declines in academic achievement (Kellam et al., 1991; Roese et al., 2000) as well as long-term educational attainment (Bardone, Moffitt, Caspi, Dickson, & Silva, 1996). Internalizing symptoms may affect children’s motivation, self-regulation, concentration, and other executive functioning skills, undermining their ability to learn and excel in the school environment. However, some studies suggest that the effect of internalizing symptoms on academic competence is less robust than the effect of academic competence on internalizing symptoms (Cole et al., 1997; Shochet, Dadds, Ham, & Montague, 2006). Similarly, a few studies indicate that internalizing symptoms may undermine social competence; however, these effects seem to be inconsistent across age, gender, and indices of social competence (Capaldi, 1992; Capaldi & Stoolmiller, 1999; Cole et al., 1997; Mesman et al., 2001). In a study examining transactional effects, Cole et al. (1996) reported that competence predicted longitudinal stability in symptoms, whereas symptoms did not predict longitudinal stability in competence. Thus, more research is needed to determine the developmental timing and directionality of these effects.

In sum, studying processes by which academic achievement, social competence, and internalizing symptoms may affect one another over time has important implications, given the significance of these domains for long-term adaptation. Failure to achieve age-salient developmental tasks can place children and adolescents on various maladaptive trajectories that lead to mental health problems as well as poor work and romantic competence (Masten et al., 2006). Moreover, it is important to examine whether the interplay between competence and symptoms varies across gender, given that boys and girls may have different developmental antecedents, pathways, and consequences of adaptive or maladaptive behavior (Masten et al., 1995; Zahn-Waxler, Crick, Shurtleff, & Woods, 2006). Although higher mean levels of internalizing symptoms in girls are well established, starting in early adolescence, the gender differences in pathways contributing to this increase are less clear (Crick & Zahn-Waxler, 2003). Early work has focused exclusively on boys, and so it is not clear whether boys or girls are more vulnerable to dual failure effects. Cole (1991) showed that associations between competence and depressive symptoms were linear in boys and nonlinear in girls, such that girls with extreme levels of academic and social incompetence were particularly vulnerable to internalizing symptoms. Although researchers point out that girls are more negatively affected by interpersonal stressors (Crick & Zahn-Waxler, 2003; Little & Garber, 2004), a few studies indicate that peer popularity and social problems were more strongly related to boys’ internalizing symptoms than girls’ (Girgus, Nolen-Hoeksema, & Seligman, 1989; Mesman et al., 2001). Given robust gender differences in the prevalence and manifestation of internalizing across adolescence and adulthood, it is important to examine how different age-salient domains of adaptive functioning contribute to development of internalizing symptoms and vice versa.

The current study was designed to test a dual cascade model linking social and academic problems to subsequent internalizing symptoms across a 20-year period. Cascade effects were compared to alternative models through a nested set of structural equation models testing longitudinal relations among internalizing behavior problems, academic competence, and social competence (see Figure 1). These models addressed gaps in the literature just reviewed by (a) testing the unique effects of academic and social competence on internalizing symptoms from childhood to young adulthood, (b) examining transactional effects between academic and social competence during this period, (c) exploring alternate pathways from internalizing symptoms to academic and social competence, and (d) examining the role that adversity exposure plays in setting and maintaining developmental cascades. First, we examined the longitudinal interindividual stability of each domain (for simplicity this is referred to as “stability” from this point forward) and within-time covariation between the three domains of functioning. Based on previous research with these data (Burt et al., 2008; Masten et al., 2005) and other studies (Obradović et al. 2006), we hypothesized stability of competence and symptoms from childhood to young adulthood, as well as covariation of the three domains during childhood. Second, we tested cascading effects from academic and social competences to internalizing symptoms. Guided by the competency-based model of Cole (1990) and the dual failure model of Patterson and colleagues (Patterson & Stoolmiller, 1991), we expected that each competence domain would uniquely predict internalizing symptoms. Third, we examined transactional effects between academic and social competence, expecting to replicate and extend Welsh et al.’s (2001) findings past childhood. Fourth,
we tested whether internalizing predicted academic competence. Fifth, we examined the effect of internalizing symptoms on social competence. Given inconclusive evidence for internalizing symptoms as a predictor of competence, these latter two models were exploratory. After identifying the best-fitting model, we introduced childhood externalizing behavior problems into this model to examine to what degree any dual cascade effects found for academic and social behavior may have been due to pervasive effects of early antisocial behavior or confounds in reporting of symptoms. We expected that childhood externalizing symptoms would show cascade effects to later academic problems, as reported by Masten et al. (2005) for this sample and found in other studies (e.g., Hinshaw, 1992). Nonetheless, we expected that the dual cascade from social and academic functioning to internalizing problems would be observed even with effects of externalizing symptoms taken into account. Next, we examined the effects of gender, age, and exposure to environmental adversity on this model. Because gender and age differences in the longitudinal interplay between competence and symptoms have not been clearly identified, these analyses were exploratory. We expected that dual cascade effects would persist, controlling for the well-established negative effects of adversity exposure on adaptation.

METHODS

Sample and Procedure

Participants for this study were drawn from a normative sample of 205 children (91 boys and 114 girls), including 26 sibling pairs, who together with their parents participated in a 20-year longitudinal study of competence and resilience, initiated in 1977–78 when the children were 8 to 12 years old (Masten et al., 1995; 1999; 2005). Children were recruited from two public elementary schools in an urban neighborhood of Minneapolis that represented the city’s socioeconomic and ethnic diversity. In the original sample, 29% of the children were ethnic minority (18% African American, 7% Native American, 3% Hispanic, 1% Asian). Like the catchment community, the sample represented a diverse range of socioeconomic backgrounds, from families on welfare with low levels of education and income to well-educated, upper- to middle-class professionals (Duncan Index sample range = 7–92; Hauser & Warren, 1997). After initial assessment (T1), children and families completed follow-up assessments approximately 7 (T2), 10 (T3), and 20 (T4) years later, with retention rates of 88%, 98%, and 90%, respectively. (Twenty-year assessments were conducted 1999–2002.) At all four time points, informed consent was obtained from parents and/or all procedures were approved by the relevant Institutional Review Board.

Measures

Due to space restrictions, measures for each construct are described briefly here. Greater detail is provided in Masten et al. (2005) for academic competence and internalizing measures and in Burt et al. (2008) for social competence measures. Multimethod and multi-informant measures were drawn from test scores, school records, peer assessments (i.e., the Revised Class Play), participant and parent questionnaires and interviews (i.e., Status Questionnaires [SQ], Competence Rating Scales [CRS]), and interviewer ratings. Over 20 years, many procedures such as exploratory factor analyses and internal consistency analyses were employed in construct development, and all constructs show strong psychometric properties (high internal consistency and interrater agreement, as well as construct and predictive validity; see Gest, Sesma, Masten, & Tellegen, 2006; Masten et al., 1995; 1999; 2005). Age-appropriate indices of competence and psychopathology changed over time due to developmental considerations, as described next.

Academic competence. Conceptualization of academic competence shifts from academic achievement to attainment with participants’ completion of formal education. T1 academic competence (Aca1) was assessed by four indicators: (a) Peabody Individual Achievement Test total score (Dunn & Markwardt, 1970), (b) school GPA, (c) teacher rating from the Devereux Behavior Rating Scale (Spivack & Swift, 1967) of how well the target child knows class material, and (d) a composite of three parent interview items tapping academic success. T2 academic competence (Aca2) was assessed by (a) school-reported GPA; (b) a self-report composite of GPA, SQ ratings of educational success, and a CRS item on academic skills (“Some teenagers do very well on their classwork”); and (c) a parent-report composite of parallel SQ ratings and two CRS items. T3 academic competence (Aca3) was assessed by (a) independent ratings of academic achievement based on self-report SQ information, (b) parallel but independent ratings based on parent SQ information, (c) interviewer ratings of grades and academic attainment based on participant interview, and (d) interviewer ratings of academic performance based on parent interview. T4 academic competence (Aca4) was assessed by (a) a rating of educational success based on participant description of educational experiences, (b) a composite of educational attainment and success items from participant SQ, and (c) a parallel composite from parent SQ. All intraclass
correlation coefficients (ICC) for independent rater indicators and coefficient alpha statistics for item composites exceeded .80, except for SQ composite alphas for T4, which were .66 for participant report and .62 for parent report.

**Social competence.** Social competence is conceptualized as a broad adaptive domain that includes indices of peer acceptance, social skills, friendship formation and maintenance. The specific indices vary with age because expectations for social competence change as children grow older. In childhood, peer acceptance and having friends are important criteria of social competence. As young people mature, friendship quality becomes more salient in measures of social competence. *T1 social competence* (Soc1) was assessed by (a) the Popular/Leader and (b) reversed Peer Isolation subscales of the Revised Class Play peer nomination procedure (Gest et al., 2006) and (c) a composite of nine clinical ratings of global social acceptance, close friendships, and getting along well with others, based on participant interview. *T2 social competence* (Soc2) was assessed by (a) an SQ rating of active/positive social life based on participant information, (b) a parallel rating based on parent information, and (c) a composite of seven parent CRS items assessing close friendships and social acceptance. *T3 social competence* (Soc3) was assessed by (a) SQ ratings of active/positive social life based on participant information, (b) parallel ratings from parent SQ, (c) parallel ratings from parent interview, (d) ratings from participant interview about the closeness and reciprocity of the participant’s best friend relationship, and (e) a composite of four CRS items assessing close friendships and social acceptance. *T4 social competence* (Soc4) was assessed by (a) SQ ratings of close, confiding friendships based on participant information; (b) a single parent SQ item assessing whether the participant’s closest friendship is positive; (c) a composite of five participant SQ items assessing satisfaction and support from the close friend; and CRS items assessing close friendship from (d) participant and (e) parent report. All ICC for independent rater indicators and coefficient alpha statistics for item composites exceeded .80, except for participant SQ ratings at T3 (ICC = .76) and T4 (ICC = .76; χ = .78).

**Internalizing problems.** In this study we focus on broad internalizing problems, such as symptoms of depressed mood, anxiety, social withdrawal, and somatic complaints. *T1 internalizing problems* (Int1) were assessed via parent report on a symptom checklist used at local psychiatric clinics at the study’s onset, with content and structure highly similar to the subsequently published Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983). Three indicators of internalizing (Anxious/Depressed, Withdrawn, and Somatic Complaints) were calculated to parallel the factor structure of the CBCL (see Burt et al., 2008). *T2 internalizing problems* (Int2) were assessed by CBCL and Youth Self Report (Achenbach, 1991) subscales of Anxious/Depressed, Withdrawn, and Somatic Complaints. *T3 internalizing problems* (Int3) were assessed using participant report on the Symptom-Checklist-90–Revised, a self-report measure of distress including broad internalizing content (Derogatis, 1983). Three indicators were derived from subscales representing the broad internalizing dimension: Anxiety, Depression, and Somatization. *T4 internalizing problems* (Int4) were assessed using participant and parent report on the Anxious/Depressed and Withdrawn subscales of the Young Adult Behavior Checklist (Achenbach, 1997) and Young Adult Self-Report (Achenbach, 1997). All coefficient alpha values for internalizing indicators exceeded .80, except T1 Withdrawn (.42) and Somatic Complaints (.78) and T4 Withdrawn (.74 for parent report, .61 for self-report). Raw scores on the Achenbach internalizing measures reflected the normative nature of the sample (e.g., for self-report, mean T scores were 51.5, SD = 9.4, at T2 and 49.5, SD = 9.9, at T4).

**Externalizing problems.** *T1 externalizing problems* (Ext1) were included in follow-up analyses (described next). Parallel to internalizing problems, externalizing problems were assessed by parental report on a symptom checklist. For the present study, two indicators of aggressive behavior (χ = .76) and delinquent behavior (χ = .62) were employed (see Masten et al., 2005, for specific item content).

**Adversity.** Exposure to cumulative adversity arising from physical ailments, family negative life experiences, and community stressors was measured by compiling data from multiple informants during three periods preceding adaptation assessments: from birth to T1, from T1 to T2, and from T2 to T3. Judges with clinical psychology training and experience, who were blind to the participant’s adjustment, independently rated the cumulative severity of global adversity using life history charts for the period being judged and a 7-point stressor scale ranging from minimal to catastrophic adversity exposure (ICC = .84). Only experiences independent of (unlikely to be caused by) the child’s behavior were included in the life event charts or this adversity score. During a given period, such as the period from birth to Time 1, a child who experienced only common/routine events, such as a friend’s move, or isolated events, such as a sibling jailed overnight, would have a low score (1 = minimal adversity); a child exposed to
several more challenging or stressful events such as a family move or being the victim of a mugging would have a moderate score (4); a child with more cumulative exposure to multiple or chronic events, such as an interparental conflict, divorce, or stressful family illnesses, would have a higher score (5 = severe); and a child who lost both parents in an accident, was abandoned by a single parent, endured chronic physical or sexual abuse by a family member, or suffered the murder of a parent by a stranger would have the highest rating.
(7 = catastrophic adversity). For the purposes of this study, we used cumulative adversity ratings to examine how exposure to stressors proximal to a child may affect adaptation. Average levels of adversity exposure during three assessment periods were 4.97, $SD = 1.47$; 5.34, $SD = 1.15$; and 4.51, $SD = 1.48$. Please see Gest, Reed, and Masten (1999) for more details.

Statistical Analyses

Percentage of missing data ranged across indicators and time with a mean of 7.8%. All available data were included in each model using maximum likelihood estimation. Potential effects of missing data status on core constructs (social competence, academic competence, and internalizing problems) at all time points, T1 externalizing, and T1–T3 adversity variables were examined using multivariate analyses of variance. Missing data status was examined separately using status at T2, T3, and T4 (there was no missing data on aggregated core constructs at T1). Results showed no overall effect of having missing data at T2, multivariate $F(12, 158) = 0.95, ns$; T3, multivariate $F(12, 154) = 0.49, ns$; or T4, multivariate $F(13, 155) = 1.20, ns$. In addition, no univariate tests were statistically significant at $p < .05$ in these analyses.

All structural equation modeling was conducted using Mplus 5.1 (L. Muthén & Muthén, 2007). Models were estimated using the MLR option in Mplus to account for nonnormal indicators and an embedded cluster model (TYPE=COMPLEX and CLUSTER options) was used to model dependencies among the 26 sibling pairs. Although commonly reported model fit indices are included, our primary focus was the relative fit of nested models judged from a scaled chi-square difference test, using adjusted chi-square relative fit of nested models judged from a scaled fit indices are included, our primary focus was the 26 sibling pairs. Although commonly reported model options) was used to model dependencies among the multivariate analyses (not presented for space reasons), are available upon request.

Measurement models from prior analyses with these data suggested that aggregation of the same informant data would be necessary at certain time points for stable model runs, and this was confirmed for the present study as well. Therefore, composites of internalizing and social competence were formed for each informant at T2, T3, and T4, and correlated residuals for these indicators were included to model shared informant variance. Factor loadings and indicator $R^2$ for the final structural model are presented in Table 1. Following establishment of an appropriate measurement model, a series of nested structural models was tested (see Figure 1). All models included within-time correlations among latent constructs (e.g., Int1 with Aca1) although for simplicity they are not presented in Figure 1. Because of power considerations, longitudinal paths were estimated only between adjacent time points. Model 1, also considered a baseline model, estimated stability paths within each construct but no paths across domains. Model 2 added paths from academic and social competence to internalizing problems. Model 3 added paths between academic and social competence. Model 4 added paths from internalizing to academic competence. Model 5 added paths from internalizing to social competence.

Following establishment of a best-fitting model from the series above, we conducted a series of four follow-up analyses. The first follow-up analysis tested the significant paths, controlling for externalizing problems at T1, based on the well-documented association of internalizing and externalizing in childhood. Power and parameter estimation considerations precluded testing a model including externalizing problems at each time point. The second and third follow-up analyses tested the final model with T1 externalizing for gender invariance and effects of age, respectively. The final follow-up analysis examined the effects of childhood, adolescent, and emerging adulthood adversity exposure.

RESULTS

The measurement model just described showed acceptable fit, comparative fit index (CFI) = .939, Tucker–Lewis index (TLI) = .921, root mean square error of approximation (RMSEA) = .047, with standardized indicator loadings (all significant at $p < .05$) ranging from .38 to .99 ($Mdn = .79$; indicator $R^2$ range = .14–.99, $Mdn = .63$). Full numeric details regarding the measurement model, as well as a correlation matrix of all manifest indicators (not presented for space reasons), are available upon request.

Nested model comparisons are presented in Table 2, with $c$ representing a scaling coefficient used with nonnormally distributed indicators (Satorra, 2000). Model 1, the baseline stability-only model, had the following fit indices: CFI = .906, TLI = .889, RMSEA = .055. Again, our analytic focus was on incremental improvements in model fit gained from estimating successive sets of cross-domain paths. As shown in Table 2, based on chi-square tests Model 2 fit better than Model 1, $\Delta \chi^2(6) = 59.91, p < .001$; Model 3 fit better than Model 2, $\Delta \chi^2(6) = 17.53, p < .01$; and Model 4 fit better than Model 3, $\Delta \chi^2(3) = 8.65, p < .05$. However, Model 5 did

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1Given the central nature of social withdrawal to both social competence and internalizing problems, we also examined the effects of construct overlap by reanalyzing the best-fitting model (i.e., Model 4) after removing indicators of withdrawn behaviors from internalizing problems. This modified model had borderline overall fit (CFI = .910, $\chi^2(910, TLI = .891, RMSEA = .053$). One path became nonsignificant in this model: from Soc1 to Int1 ($-.32$ changed to $-.23$). Paths from Aca3 and Soc3 to Int4 also decreased slightly (to $-.37$ and $-.41$, respectively) but remained statistically significant.
not significantly improve the relative model fit, \( \Delta \chi^2(3) = 6.49, p = .09 \). Therefore, Model 4 was adopted as our final structural model. This model had acceptable overall fit (CFI and TLI > .90, RMSEA < .05; McDonald & Ho, 2002).

Standardized path estimates and latent variable \( R^2 \) values for Model 4 are presented in Figure 2. Within-time associations showed that at initial assessment academic and social competence were positively related, and social competence and internalizing problems were negatively related. Accounting for initial associations, longitudinal stability, and various cross-domain paths, no other within-time associations were statistically significant. Academic and social competence were quite stable over time, with a drop in social competence stability from T3 to T4 that likely reflects a change in measurement emphasis from global peer acceptance to close friendships. Internalizing problems were less stable, and the path from Int3 to Int4 (estimated at .26) was not significant when other paths to Int4 were also included.

Significant cross-domain paths in the final model included Int1 to Aca2 (−.14), Soc1 to Int2 (−.32), Aca2 to Soc3 (.23), and Aca3 and Soc3 to Int4 (−.38 and −.53, respectively). In brief, comparison with our prior analyses from this dataset showed that key cross-domain paths from competence to internalizing across emerging adulthood were significant controlling for the other broad domain of competence (e.g., Aca3 and Soc3 to Int4), as was the earlier link from social competence to internalizing.

Follow-Up Analyses

**Externalizing problems.** Although the primary focus of the present paper was to test cross-domain effects between competence and internalizing problems, it was important to evaluate the results of these effects in the context of externalizing problems. Associations between externalizing and internalizing in childhood are well documented, and earlier findings in this study indicated a cascade from externalizing at T1 (Ext1) to academic to internalizing symptoms (Masten et al., 2005). Inclusion of Ext1 produced a model with acceptable overall fit (CFI = .922, TLI = .906, RMSEA = .050; see Figure 3). Consistent with expectations, the path from Int1 to Aca2 was replaced by a significant path from Ext1 to Aca2 (−.56). At initial assessment, externalizing and internalizing were positively correlated, and externalizing problems were negatively correlated with social competence. All other cross-domain paths from Model 4 were essentially unchanged. Thus, Model 4 with Ext1 implicated a sequence of longitudinal cross-domain paths from Ext1, to Aca2, to Soc3, to Int4 and was retained as the final model.

**Gender invariance.** Using Model 4 with Ext1 we examined metric (magnitude of loadings) gender invariance of the measurement model as well as gender invariance of the stability and cross-domain paths. As none of the gender invariance tests had acceptable overall fit, we focused on relative fit of constrained versus free parameters. Because a measurement model with varying factor loadings across gender did not converge, possibly due to the large number of parameters involved, subsequent models used a constrained measurement model for baseline. These analyses showed evidence for gender invariance of stability paths, \( \Delta \chi^2(9) = 9.66, \text{ns} \), but not cross-domain paths, \( \Delta \chi^2(16) = 29.8, p < .05 \). Additional analyses revealed that three cross-domain paths differed by gender. One path showed nonsignificant effects for both male and female participants: Soc2 to Aca3 (−.14,
opmental periods. However, the longitudinal effects of competence on symptoms varied across different development. The major goal of this study was to examine the joint effects of academic and social competence on development of internalizing behavior problems from childhood to young adulthood, controlling for prior levels and concurrent correlations of competence and psychopathology domains. Results indicated significant interindividual stability of both academic and social competence across the 20-year period and, to a lesser degree, stability of internalizing symptoms between childhood and emerging adulthood. Internalizing symptoms appeared to be less stable across the transition to adulthood. Findings were consistent with the hypothesis that prior successes or failures in social and academic competence have spillover effects on subsequent internalizing symptoms. However, the longitudinal effects of competence on symptoms varied across different developmental periods.

Childhood social competence with peers predicted adolescent internalizing problems over and above initial covariation of these domains in childhood and the stability of each domain over this developmental span of time. In contrast, childhood academic competence did not predict adolescent internalizing problems over and above the effects of social competence. These findings differ from cross-sectional studies suggesting independent effects of academic and social competence on internalizing symptoms (Cole, 1990, 1991; Patterson & Stoolmiller, 1991). Given the significant correlation of academic and social competence in childhood, it is conceivable that the influence of early childhood academic competence is carried forward to internalizing problems through its effects on social competence in elementary school (Welsh et al., 2001). The significance of childhood social competence for adolescents’ internalizing problems is consistent with the few longitudinal studies that control for within-time correlations and longitudinal stability of competence and symptoms (Cole et al., 1996). The current study extends these findings by showing that the effect of social competence persists even when associations with academic competence during this period are controlled for.

In addition, adolescent social competence predicted emerging adulthood internalizing symptoms; however, this occurred only for male participants. This finding is consistent with studies showing that links between indices of social competence and internalizing symptoms in childhood and adolescence either are stronger or emerge only for boys (Girus et al., 1989; Mesman et al., 2001) and consistent with the initial tests of the dual failure model, which focused primarily on boys (Patterson & Stoolmiller, 1991). The well-being of men during the transition to young adulthood may be particularly affected by the presence and quality of close relationships. Indeed, some researchers report that men are at higher risk than women for depression following the end of an intimate relationship (Hill, Rubin, & Peplau, 1976). However, this result needs to be replicated with longitudinal studies examining whether the role that adolescent friendships play in the development of internalizing symptoms in emerging adulthood differs for men and women. For example, there is emerging evidence that that co-rumination, which was more prevalent among girls, was associated with high-quality close friendships as well as internalizing problems (Rose, 2002). Thus, it is possible that close adolescent relationships may buffer men against internalizing symptoms but present a risk for women.

Most important, this study found that both social and academic competence in emerging adulthood uniquely predicted internalizing symptoms of young adults, extending the relevance of the dual failure and competency-based models past childhood and adolescence. In recent
years, the period of emerging adulthood has been identified as an important window of opportunity and vulnerability (Arnett & Tanner, 2006; Dahl & Spear, 2004). Academic success and quality of social relationships during the transitional years of emerging adulthood may play an important role for well-being and mental health of male and female young adults.

In addition to testing a dual failure model, this study examined the longitudinal interplay between academic and social competence from childhood to young adulthood. Although academic and social competence covaried in childhood, only academic competence in adolescence had a cascading effect on emerging adulthood social competence over and above the strong stability of both domains during this period. This is consistent with Welsh et al.’s (2001) report that academic competence in elementary school is a more robust predictor of social competence than vice versa, controlling for the stability of both domains, but the processes linking the two competence domains may vary across different developmental periods. Academic failure and school dropout have been linked to associations with delinquent peers (Dishion & Patterson, 2006). Academic success, on the other hand, may afford more positive social contexts with socially competent and prosocial peers. Achievement in high school may place adolescents on positive pathways toward higher education and better job opportunities in emerging adulthood.

Finally, results suggest that childhood internalizing problems had an effect on adolescent academic achievement over and above stability of the two domains. However, a follow-up analysis revealed that this association was driven by significant co-occurrence of childhood internalizing and externalizing symptoms. Childhood externalizing problems predicted academic competence in adolescence controlling for childhood levels of achievement. In addition, adolescent internalizing problems had a negative effect on academic achievement in emerging adulthood only for male participants. Because of limited power, we were unable to test the effect of externalizing symptoms across all four periods and determine whether this effect was due to covariation with adolescent externalizing problems. However, previous research with this sample indicates that the main cascading effect of externalizing behavior occurs in childhood (Masten et al., 2005). The importance of childhood externalizing symptoms is congruent with a dual failure model developed with boys at risk for conduct problems, positing that antisocial behavior contributes to early academic and social failure in elementary school (Patterson & Capaldi, 1990). Still, it is crucial that future studies examine whether timing and direction of transactional effects across all four domains of adaptation vary for males and females across different developmental periods.

Including externalizing symptoms in the model revealed a developmental cascade consistent with the possibility that externalizing problems in childhood spread across multiple domains by adulthood, undermining academic achievement by adolescence which in turn influences social competence in emerging adulthood and further affects young adults’ internalizing symptoms. Lack of work skills, noncompliance, and classroom disruptiveness may place externalizing children at risk of academic failure over and above stability of achievement. Academic failure in adolescence has been linked to various risky behaviors that can influence the quality of friendships in emerging adulthood, including delinquency, drug use, and teenage pregnancy. Subsequently, the lack of close and supportive friends in this transitional period may undermine the well-being of young adults. Although research consistently supports this chain reaction (Rutter et al., 2006), it is important to keep in mind that these findings could reflect the role of rule-abiding conduct (low externalizing) in a cascade of positive adaptation. Developmental scientists who study competence have argued that good control of attention and behavior associated with low childhood externalizing symptoms may foster cascades of successful achievement in childhood developmental tasks, setting the stage for successful achievement of future developmental tasks (Masten et al., 2006; Sroufe, 1979). The present findings persisted controlling for age, gender, and exposure to proximal environmental adversity from birth to emerging adulthood.

Although this study presents a unique attempt to longitudinally examine a dual failure model as well as the interplay between academic and social competence across four major developmental periods, important limitations should be noted. First, the sample size was modest for the complex set of analyses, limiting longitudinal examination of factors such as externalizing or adversity exposure, as well as testing for interaction effects. Second, the normative nature of the sample limits our contribution to understanding how competence affects the development of psychopathology in clinical populations. Third, although we strived to include multiple informants for each domain at each time point, we were not always able to do so. Fourth, intervals between assessment and ages at assessment varied in this study, so that timing of suspected cascades could not be investigated with precision. Fifth, timing of the first assessment for this study was in late childhood, well after children began school, which prevented us from testing early cascade effects. Initial associations among social competence, academic competence, and symptom domains are consistent with the possibility that some cascades had already occurred by the time this longitudinal study began. Finally, the current study focuses primarily on indices of child’s adaptation. However, it
TABLE 2
Fit Statistics and Model Comparisons for Nested Structural Equation Models

<table>
<thead>
<tr>
<th>Model</th>
<th>No. of Cross-Domain Paths</th>
<th>df</th>
<th>c</th>
<th>$\chi^2$</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>Model Comparison</th>
<th>cd</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta df$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>477</td>
<td>1.002</td>
<td>774.72</td>
<td>.890</td>
<td>.889</td>
<td>.055</td>
<td>2 vs. 1</td>
<td>N/A</td>
<td>59.91</td>
<td>6</td>
<td>.001</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>471</td>
<td>1.012</td>
<td>714.80</td>
<td>.923</td>
<td>.908</td>
<td>.050</td>
<td>3 vs. 2</td>
<td>1.167</td>
<td>17.53</td>
<td>6</td>
<td>.008</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>465</td>
<td>1.010</td>
<td>695.96</td>
<td>.927</td>
<td>.912</td>
<td>.049</td>
<td>4 vs. 3</td>
<td>1.010</td>
<td>8.65</td>
<td>3</td>
<td>.034</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>462</td>
<td>1.010</td>
<td>687.32</td>
<td>.929</td>
<td>.914</td>
<td>.049</td>
<td>5 vs. 4</td>
<td>1.163</td>
<td>6.49</td>
<td>3</td>
<td>.090</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>459</td>
<td>1.009</td>
<td>680.52</td>
<td>.930</td>
<td>.914</td>
<td>.049</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Final selected model is presented in boldface. $c$ =weighting constant for computing the chi-square statistic using robust estimation method; $cd$ =weighting constant for the difference between two chi-square values using robust estimation. CFI =comparative fit index; TLI =Tucker-Lewis index; RMSEA =root mean square error of approximation.

Scaling correction produced negative chi-square difference; therefore, standard chi-square difference test is reported for this analysis.

Implications for Research, Policy, and Practice

Results of this study extend the evidence for progressive, cascading effects from successes or failures in one domain of behavior during one period of development to successes or failures in other domains in subsequent developmental periods, often through indirect paths, and with repercussions potentially far into the future. Although this study was conducted with an urban, community sample, the current findings reveal some important information regarding key target domains and windows of opportunity for prevention and potentially intervention efforts. Externalizing behaviors in early childhood emerge as a key target domain due to the cascading effects that spread from early externalizing symptoms to other domains of adaptation over time. In particular, early externalizing symptoms may undermine academic achievement and school success, placing an adolescent at risk for various maladaptive trajectories (Hinshaw, 1992). In addition, social competence emerged as an important predictor of future internalizing problems over and above stability of symptoms, suggesting that programs aimed at improving the quality of social relationships may be effective at promoting psychological well-being. This may be especially true for males, for whom the effect of social competence on internalizing symptoms was significant between all four developmental periods. Finally, the study provides support for identifying emerging adulthood as an important window for interventions, as both academic and social competence during this time exerted unique effects on future internalizing symptoms. These findings need to be replicated with clinical samples. If developmental cascades emerge due to the negative effects of symptoms and incompetence, we believe that transactional relations will only be stronger in clinical populations. However, if developmental cascades emerge due to positive adaptation such as rule-abiding behavior, high-quality friendships, and school success, it will be important that programs targeted at clinical populations go beyond symptom reduction and focus on skill and relationship building at critical developmental periods.

Developmental cascades may account for a high return on investment in early or strategically timed and targeted interventions designed to reduce problems or promote competence in domains with spreading effects (Heckman, 2006; Masten et al., 2006). However, replication of the current findings, particularly with designs that are more sensitive to timing, will be important for future theory and interventions targeting these effects. Moreover, it will be important to study in much greater depth and at multiple levels of analysis the processes mediating such effects. Interrupting maladaptive cascades may prove to be an important strategy for intervention, and application of experimental designs with both community and clinical populations may also help test developmental theory and inform policy. Such research could enhance the effectiveness and efficiency of interventions, reduce costs, establish strategic priorities, and confirm causal theories about spreading effects and the processes underlying these cascades in development.

REFERENCES


