Published in final edited form as:

Appl Dev Sci. 2013 ; 17(2): 76–87. doi:10.1080/10888691.2013.774875.

Developmental Pathways among Adaptive Functioning and Externalizing and Internalizing Behavioral Problems: Cascades from Childhood into Adolescence

Marc H. Bornstein, Chun-Shin Hahn, and Joan T. D. Suwalsky

Child and Family Research *Eunice Kennedy Shriver* National Institute of Child Health and Human Development

Abstract

A *developmental cascade* describes a longitudinal cross-domain unique relation. Here, a 3-wave multivariate design and developmental cascade analysis were used to investigate pathways among adaptive functioning and externalizing and internalizing behavioral problems in a community sample of 134 children seen at 4, 10, and 14 years. Children, mothers, and teachers provided data. Nested path analytic models tested the plausible cascades among the three domains apart from their covariation at each age and rank-order stability across age. Adaptive functioning in early adolescence was predicted by early childhood adaptive functioning and externalizing behavioral problems, with both effects mediated by late childhood adaptive functioning and internalizing behavioral problems; externalizing behavioral problems in early adolescence were predicted by early childhood internalizing behavioral problems with the effect mediated by late childhood externalizing behavioral problems. These developmental cascades obtained independent of child intelligence; child age and maternal education and social desirability were also considered but were not related to any outcome variables. The findings suggest that strategically timed and targeted interventions designed to address young children's behavioral problems may return investment in terms of an enhanced epidemiology of adaptively functioning teens.

This prospective multi-age, multi-method, multi-informant study focused primarily on developmental pathways among adaptive functioning and externalizing and internalizing behavior problems from 4 to 10 to 14 years. The study secondarily assessed unique within-time covariations and across-time rank-order stabilities in the same three constructs in three waves across the same developmental time span. To analyze these pathways, we modeled developmental cascades from childhood to adolescence. *Developmental cascades* are longitudinal cross-domain unique relations. In a cascade, one psychological characteristic affects a different psychological characteristic in the individual over time apart from concurrent covariation between them, temporal stability in each, and (usually) other possible common-cause factors. Although distinct individual characteristics are believed to relate to one another through development (Masten & Cicchetti, 2010), few studies test developmental models of such “spreading effects” with designs that control for concurrent associations among characteristics and their stabilities to evaluate developmental cascades with all of the foregoing features. That is, the developmental literature normally fails to disentangle direction and specificity of effects or control for covarying and stability effects, and it often fails to institute appropriate or meaningful exogenous controls to isolate unique

effects; as a result, developmental findings are often more suggestive than determinative. A developmental cascades approach moves toward redressing these several shortfalls.

Adaptive Functioning and Behavioral Problems in Childhood and Adolescence

Adaptive functioning

Adaptation is a biopsychological construct that refers to the individual's active modifications to cope effectively with the demands of the natural, social, and designed environments. Adaptation fulfills a central developmental and evolutionary promise through the individual's becoming better suited, or fit, to his or her environment. Adaptations encompass everyday activities and interpersonal relationships and include skills in communication, socialization, daily living, and motor functions. Adaptations are therefore plentiful, functional, and specialized, they are fundamental to successful growth and development, and they are attained through interactions with the environment. For Sparrow, Balla, and Cicchetti (1984, p. 6), "adaptive behavior is ... defined by typical performance, not ability. While ability is necessary for the performance of daily activities, an individual's adaptive behavior is inadequate if the ability is not demonstrated when it is required Adaptive behavior is defined by the expectations or standards of other people. The adequacy of an individual's adaptive behavior is judged by those who live, work, and interact with the individual." To assess adaptive behavior in children and adolescents, we interviewed their mothers using the Vineland Adaptive Behavior Scales (VABS; Sparrow et al., 1984), which have been evaluated as foremost among 200 adaptive behavior instruments (diSibio, 1993; Kamphaus, 1987), and their teachers using the Adaptive Functioning section of the Teacher Report Form (TRF; Achenbach, 1991a).

Behavior problems

Behavior problems are conventionally reflected in two broadband factors (Achenbach & Edelbrock, 1978). Externalizing behavior problems include troubles with attention, self-regulation, and noncompliance as well as antisocial and other undercontrolled behaviors. Internalizing behavior problems include depression, social withdrawal, and anxiety as well as feelings of inferiority, self-consciousness, shyness, hypersensitivity, and somatic complaints, all of which are generally conceived of as overcontrolled.

Adaptive Functioning—Behavior Problems Associations

Adaptive functioning has been hypothesized to connect in different ways with externalizing and internalizing behavior problems over time. Masten, Burt, and Coatsworth (2006, p. 716) enumerate several "ways that competence problems may contribute to psychopathology: (1) Perceived failure could lead directly to distress and related internalizing symptoms; (2) competence problems could increase the risk of negative experiences with peers, teachers, parents, or others that aggravate or increase symptoms; and (3) competence problems could lead to a change in context (e.g., special classroom placement or school dropout) that alters the nature of opportunities, results in stigmatization, or increases affiliation with negative associates." Reciprocally, adaptive functioning may protect against the emergence and development of externalizing and/or internalizing behavior problems (Cole, Martin, Powers, & Truglio, 1996). Achievements of adaptive functioning constitute important criteria by which children judge themselves and are judged by society, and they portend positive consequences for children that lead to healthy behaviors. Adaptive functioning could help regulate self-control in that children with adaptive skills may react to daily challenges with less aggressive and disruptive behaviors or less depressed and withdrawn affect. Such children are also likely to make better impressions on and have positive interactions with

others, whereas failures to achieve age-salient developmental tasks can place children on maladaptive trajectories that undermine mental health (Cole, 1990, 1991).

Alternatively, psychopathology might undermine competence. Here, the causal explanation involves features of a disorder interfering with adaptive behavior. In the words of Ezpeleta et al. (2001, p. 901), "It is well established that psychiatric disorders result in many psychosocial problems, deviations, and limitations in addition to the 'symptoms' that are used to establish the nature of the disorder itself." Aggression or anxiety could inhibit the development of adaptive functioning (Hinshaw, 1992) or forecast future competence problems (Cole et al., 1996; Roeser, Eccles, & Sameroff, 2000). For example, disruptive behavior interferes with learning and alienates parents, peers, and teachers (Masten et al., 2005); likewise, anxiety and depression interfere with learning and may restrict exposure to opportunities to learn or practice adaptive skills (Lupien, Maheu, Tu, Fiocco, & Schramek, 2007).

Finally, adaptive functioning and behavior problems could be linked by common biological or experiential factors that contribute to both (Masten & Curtis, 2000). For example, intelligence and language skills are positively related to adaptive functioning (Platt, Kamphaus, Cole, & Smith, 1991) and negatively related to externalizing and internalizing behavior problems across childhood (Schonfeld, Shaffer, O'Connor, & Portnoy, 1988), even after controlling for ethnicity and socioeconomic status (Evans, 1996).

Few studies differentiate these competing models of associations between adaptive behavior and externalizing and internalizing or control for potential confounders, as we do here. To refine our assessments of different possible relations, we controlled children's age and general intelligence in assessing developmental cascades between adaptive functioning and the two sorts of behavior problems; because we used mothers' reports, which may be influenced by the extent of their knowledge or response biases (e.g., Johnson, Shavitt, & Holbrook, 2011), we also examined maternal education and social desirability bias.

Covariation and Stability of Adaptive Functioning and Behavior Problems across Childhood and Adolescence

A developmental cascade design accounts for covariation among characteristics at each time point as well as their rank-order stability over time. We secondarily studied unique covariation and stability of these characteristics from childhood through adolescence across the ages from 4 to 10 to 14 years nested within the cascade design.

Covariation

A general literature has developed that hypothesizes concurrent relations between adaptive functioning behavioral problems (Cicchetti, 1984, 1990; Masten, 1989). Most broadly, use of a global assessment of functioning (GAF) scale (Axis V) in the *DSM* explicitly acknowledges interrelations between competence and psychopathology. In addition, specific studies with select medically, socially, and demographically at-risk samples have reported concurrent associations between adaptive functioning and internalizing or externalizing (Barkley et al., 2002; Clark, Dogan, & Akbar, 2003; de Bilt, Systema, Kraijer, Sparrow, & Minderaa, 2005). With respect to internalizing and externalizing covariation, extensive data give evidence of positive (zero-order) associations between these two problem behavior domains (Achenbach & Edelbrock, 1983; Angold, Costello, & Erkanli, 1999; Hinshaw, 1992).

Stability

Rank-order stability among individuals describes consistency in the relative standing of individuals in a group with respect to some characteristic through time. Adaptive functioning (Sparrow et al., 1984) and externalizing and internalizing behavior problems (Hofstra, van der Ende, & Verhulst, 2000; Koot, 1995; Mesman & Koot, 2001) reportedly have moderate to strong rank-order stabilities.

This Study

Guided by extant research, we developed three main hypotheses relative to our primary and secondary questions. First, we expected to find covariation among adaptive functioning and both types of behavior problems in childhood and adolescence as well as rank-order stability in each. Second, we hypothesized cross-domain cross-time paths between adaptive functioning and externalizing behavior problems and between adaptive functioning and internalizing behavior problems between adjacent time points, even after controlling for their covariation and stability. For example, we expected that young children with more externalizing behavior problems might function less adaptively later and that young children who function more adaptively would later experience fewer internalizing problems. Third, we hypothesized cross-domain cross-time paths between externalizing and internalizing behavior problems after controlling for their covariation, stability, and cross-domain cross-time correlations with adaptive functioning. Specifically, internalizing behavior problems might curtail externalizing behavior problems through inhibition, withdrawal from risk-taking, or protections afforded by self-isolation from deviant peers (Mesman, Bongers, & Koot, 2001; Moffitt, Caspi, Harrington, & Milne, 2002). It might also be the case that externalizing behavior problems predict internalizing behavior problems, as when antisocial behavior leads to academic and social problems that in turn contribute to depression (Kiesner, 2002; Lahey, Loeber, Burke, Rathouz, & McBurnett, 2002). Last, in a follow-up analysis, we hypothesized that the final path model of relations would also hold controlling for key exogenous variables and third-variable common causes.

Methods

Participants

Families were recruited through mass mailings and newspaper advertisements from a U.S. east coast metropolitan area. 134 European American families provided data when their children were 4.05 ($SD = 0.09$, $range = 3.87$ to 4.62), 10.24 ($SD = 0.14$, $range = 9.99$ to 10.81), and 13.83 ($SD = 0.25$, $range = 13.48$ to 14.82) years of age. All children were healthy and firstborn; 53 were girls. At the first assessment, mothers averaged 35.46 years old ($SD = 5.12$, $range = 20.59$ to 49.63). Families were recruited from a broad range of socioeconomic status (Hollingshead, 1975, $M = 56.41$, $SD = 8.89$, $range = 34$ to 66). Thus, ours was a socioeconomically heterogeneous (not homogenous middle-class) community sample in terms of family SES, but we recruited an ethnically homogenous European American sample because child adaptive functioning and behavioral problems are known to vary with ethnicity (e.g., Greenfield, Keller, Fuligni, & Maynard, 2003; Tombakan-Runtukahu & Nitko, 1992) and because a majority of the population of the United States self-identifies as European American in descent (Humes, Jones, & Ramirez, 2011; Tilton-Weaver & Kakiyama, 2008; U.S. Census Bureau, 2008). An ethnically homogenous community sample constitutes an appropriate first step in understanding the matrix of associations surrounding adaptive functioning and behavior problems that logically antecedes embarking on more complex studies and analyses with ethnically diverse samples. This study therefore intentionally avoids ethnicity confounds that have plagued the developmental literature and would cloud our findings.

Adaptive Functioning

At all 3 ages, mothers reported children's adaptive functioning using the Vineland Adaptive Behavior Scales (Sparrow et al., 1984) Interview Edition. The VABS consists of communication, socialization, daily living, and motor function subdomains and an overall Adaptive Behavior Composite (ABC). The VABS Interview Edition was normed on 3,000 individuals aged newborn to 18 years, 11 months. Reliability estimates using coefficient α to determine consistency of responses range from .96 to .98 ($M = .98$) for the ABC; the median coefficients for Communication, Socialization, Daily Living Skills, and Motor Skills are .93, .94, .95, and .80, respectively. Sparrow et al. (1984) showed that the VABS have high stability reliability: Split-half reliability, test-retest reliability ($n = 484$ over 17 days), and inter-rater reliability ($n = 160$ for 2 interviewers over an interval of 8 days) for the ABC were .94, .88, and .74, respectively. Validity of the VABS is supported by evidence that it correlates positively with chronological age (older children exhibit more adaptive behaviors than younger children; Sparrow et al., 1984, Tombakan-Runtukahu & Nitko, 1992); by performance differences in the VABS among various supplementary norm groups (children with normal intelligence score higher than children with mental retardation on adaptive behavior; Sparrow et al., 1984, Tombakan-Runtukahu & Nitko, 1992); and by factor analytic data supporting the underlying structure of the VABS (Sparrow et al., 1984). At 10 years, children's teachers ($\alpha = .87$) completed the Adaptive Functioning section on the Teacher Report Form (Achenbach, 1991a).

Behavior Problems

Externalizing behavior problems were assessed by parent, teacher, and (at 14 years) adolescent reports on checklists: At 4 years, mothers completed the Hostile-Aggressive and Hyperactive-Distractible subscales of the Preschool Behavior Questionnaire (PBQ; Behar & Stringfield, 1974); at 10 years, mothers completed the Aggressive Behavior and Delinquent Behavior (ABDB) scales of the CBCL and teachers completed the TRF; at 14 years, mothers completed the ABDB scales of the CBCL, and adolescents completed the Youth Self-Report, the self-report version of the CBCL (YSR; Achenbach & Rescorla, 2001). Internalizing behavior problems were similarly assessed: at 4 years, using the single PBQ Anxious-Fearful subscale; at 10 years, using CBCL and TRF Anxious-Depressed, Somatic Complaints, and Withdrawal scales; and at 14 years, using the CBCL and YSR Anxious-Depressed, Somatic Complaints, and Withdrawal scales. Among our sample of mothers, α s for PBQ Hostile-Aggressive, Hyperactive-Distractible, and Anxious-Fearful subscales were .76, .79, and .64, respectively; α s for CBCL/4-18 Externalizing scales were .89 for both ages 10- and 14-year data; for the Internalizing scale α s were .86 and .85, respectively, for 10 and 14-year data. The α s for TRF Externalizing and Internalizing scales were .93 and .89, respectively, in our sample of teachers, and for YSR Externalizing and Internalizing scales .84 and .90, respectively, in our sample of adolescents.

Based on previous research on the factor structure of the PBQ (Fowler & Parke, 1979), we created a mean standard score for 4-year externalizing behavior problems using the Hostile-Aggressive and Hyperactive-Distractible subscale scores. At 10 and 14 years separately, externalizing behavior problem scores were computed as raw summary scores of the Aggressive and Delinquent Behavior scores for each informant, and internalizing behavior problem scores were the raw summary scores of the Anxious-Depressed, Somatic Complaints, and Withdrawal scores for each informant.

Covariates

To determine whether significant cascade paths could be explained by shared variance with control variables, we explored child age and 3 other candidate covariates; child intellectual functioning using the Wechsler Preschool and Primary Scale of Intelligence-Revised

(WPPSI-R; Wechsler, 1989) at 4 years and the Wechsler Intelligence Scale for Children, 3rd Edition (WISC III; Wechsler, 1991) at 10 years; maternal education using the Hollingshead (1975) Index 7-point education scale at all 3 ages; and maternal social desirability bias on the Social Desirability Scale (SDS-SF; Reynolds, 1982) that assesses tendency to reply to questions in a socially desirable fashion using statements rated as *True* or *False*.

Preliminary Analyses and Analytic Plan

In 134 children, 8.44% of the total data points were missing completely at random, Little's MCAR test $\chi^2(624) = 607.45, p = .68$; missing data points were imputed using the Expectation-Maximization algorithm (Dempster, Laird, & Rubin, 1977). The two indicators of adaptive functioning correlated at 10 years, $r(132) = .43$; the two indicators of externalizing behavior problems correlated at 4, 10, and 14 years, $r_s(132) = .36, .42$, and $.25$; and the two indicators of internalizing behavior problems correlated at 10 and 14 years, $r_s(132) = .39$ and $.41, p_s < .01$. Summary scores representing 4-, 10-, and 14-year adaptive functioning and externalizing and internalizing behavior problems were each computed as the mean standard scores of all relevant scale scores obtained at each age and used in path models. The VABS ABC was the sole indicator of 4- and 14-year adaptive functioning, and the PBQ Anxious-Fearful subscale was the sole indicator of 4-year internalizing behavior problems; they were used as observed variables in the path models.

Prior to fitting any path analysis models, we inspected bivariate plots to confirm that variables in the models were linearly related and no curvilinear relations obtained between pairs of variables. We fit path models using maximum likelihood functions following the mathematical models of Bentler and Weeks (1980) as implemented in EQS 6.1 (Bentler, in press; Bentler & Wu, 1995). When fitting path models, Mardia (1970) coefficients of multivariate kurtosis and cases that contributed most to those estimates as well as the stability of parameter estimates and any cases that contributed disproportionately to parameter estimates were evaluated. No significant problems of nonnormality emerged.

We assessed model fit using the robust Satorra-Bentler scaled χ^2 -statistic (S-B χ^2 ; Satorra & Bentler, 1988, 1994) and the robust comparative fit index (CFI; Bentler, 1990). The standardized root mean squared residual (SRMR; Browne & Cudeck, 1993) is reported because of the relatively small sample size ($N < 250$; Hu & Bentler, 1999). Cutoff values close to .95 for CFI and close to .09 for SRMR are indicative of a relatively good fit between the hypothesized model and the observed data (Hu & Bentler, 1999). To evaluate the significance of parameter estimates in the models, we report the standardized coefficients and evaluated their probabilities using the robust standard errors for the unstandardized coefficients. This study focused on longitudinal links from 4 years to 14 years; in consequence, of all cross-domain indirect effects that were significant, we report the standardized regression coefficients and their significance levels. To address issue of the robustness of the indirect effect, we implemented a bootstrapping method using 1,000 resamples and report bias-corrected 95% CIs (MacKinnon, Lockwood, & Williams, 2004).

Results are discussed as follows. First, descriptive statistics are reported. Second, the first hypothesis about within-time covariation among domains and rank-order stability of each domain was evaluated using the zero-order concurrent correlations between adaptive behaviors and behavioral adjustment and the correlations of each domain between adjacent time points (where $r \approx .10$ is interpreted as a small effect, $r \approx .25$ as a medium effect, and $r \approx .40$ as a large effect; Cohen, 1988). Third, the second and third hypotheses about cross-domain cross-time predictions were tested using path analytic models. Finally, the cascade model was re-evaluated taking into consideration child age and intellectual functioning, as well as maternal education and social desirability bias as potential covariates.

Results

Descriptive Statistics

Table 1 presents means and *SDs* of all measures and potential covariates; mean scores fell ≈ 1 *SD* of means reported in normal or standardized samples of similar children on measures of adaptive functioning and behavior problems (Behar & Stringfield, 1974; Sparrow et al., 1984; Stanger & Lewis, 1993; Wechsler, 1989, 1991).

Covariation and Rank-Order Stability

Table 2 presents the correlation matrix of all variables in the cascade model. At all three ages, externalizing and internalizing behavior problems were positively correlated, and both were negatively correlated with adaptive functioning. Adaptive functioning and externalizing and internalizing behavior problems showed medium to strong stability from 4 to 10 years and from 10 to 14 years.

Cascade Analyses

The developmental cascade model fit the data well: S-B $\chi^2(9) = 16.74$, $p = .053$, Robust CFI = .98, SRMR = .04. Figure 1 presents the standardized solution to the cascade model.

Cross-domain cross-time predictions between adaptive functioning and externalizing behavior problems, and between adaptive functioning and internalizing behavior problems—Three significant cross-domain predictions emerged from the model. Children with higher levels of adaptive functioning at 4 years exhibited fewer internalizing behavior problems at 10 years. Children who exhibited more externalizing behavior problems at 4 years displayed lower levels of adaptive functioning at 10 years. Children who exhibited more internalizing behavior problems at 10 years displayed lower levels of adaptive functioning at 14 years.

Cross-domain cross-time predictions between externalizing and internalizing behavior problems—Two significant cross-domain predictions emerged from the model. Children who exhibited more externalizing behavior problems at 4 years exhibited more internalizing behavior problems at 10 years, and children who exhibited more internalizing behavior problems at 4 years exhibited fewer externalizing behavior problems at 10 years.

Cascades—Of primary interest were developmental cascades, longitudinal cross-domain unique relations, here operationalized as links among adaptive functioning and externalizing and internalizing behavior problems from early childhood to late childhood to early adolescence. Figure 1 shows three significant 3-wave cascades that emerged from the model. (In the text below for the decomposition of the significant 3-wave cascade effects, we report only those that were mediated by significant 2-wave cross-domain cross-time effects.) In the first cascade, 14-year adaptive functioning was predicted by 4-year adaptive functioning (standardized indirect effect = .25, $p < .001$, and the 95% bootstrapped bias-corrected CI = [.13, .34]) with the effect mediated by 10-year adaptive functioning (standardized indirect effect = .21) and 10-year internalizing behavior problems (standardized indirect effect = .04). Children with higher levels of adaptive functioning at 4 years achieved higher levels of adaptive functioning and exhibited fewer internalizing behavior problems at 10 years, and at 14 years they displayed higher levels of adaptive functioning. In the second cascade, 14-year adaptive functioning was predicted by 4-year externalizing behavior problems (standardized indirect effect = $-.19$, $p < .001$, and 95% the bootstrapped bias-corrected CI = $[-.30, -.07]$) with the effect mediated by 10-year adaptive functioning (standardized indirect effect = $-.12$) and 10-year internalizing behavior problems (standardized indirect effect = $-.04$). Children who exhibited more externalizing

behavior problems at 4 years displayed lower levels of adaptive functioning and exhibited more internalizing behavior problems at 10 years and subsequently at 14 years displayed lower levels of adaptive functioning. In the third cascade, 14-year externalizing behavior problems were predicted by 4-year internalizing behavior problems (standardized indirect effect = $-.14$, $p < .05$, and the 95% bootstrapped bias-corrected CI = $[-.26, -.03]$) with the effect mediated by 10-year externalizing behavior problems (standardized indirect effect = $-.13$). Children who exhibited more internalizing behavior problems at 4 years exhibited fewer externalizing behavior problems at 10 years and at 14 years exhibited fewer externalizing behavior problems.

Components of adaptive behavior—The VABS Composite (ABC) consists of three domains: Communication, Socialization, and Daily Living Skills. (The Motor Skills domain is not appropriate after 6 years of age.) We conducted a post-hoc analysis to identify domain(s) of the VABS that might underlie cascade effects. Three separate cascade models were evaluated in which each of the three VABS domain scores was substituted for the ABC in the path analytic model. All three domains were as effective as the ABC in producing significant 3-wave cascade effects, indirect effects ranging from $.10$, $p < .01$, for Daily Living Skills to $.16$, $p < .001$, for Communication for the predictive ability of 4-year adaptive functioning on 14-year adaptive functioning mediated by 10-year adaptive functioning and internalizing behavior problems. Indirect effects for Communication, Socialization, and Daily Living Skills were all $-.13$, $p < .05$, for the predictive ability of 4-year internalizing behavior problems on 14-year externalizing behavior problems mediated by 10-year externalizing behavior problems, after controlling for the within-time covariation (3 separate models with the 3 different VABS domain scores) and the stability of each. Indirect effects were $-.19$, $p < .001$, for Socialization and $-.14$, $p < .05$, for Daily Living Skills for the predictive ability of 4-year externalizing behavior problems on 14-year adaptive functioning mediated by 10-year adaptive functioning and internalizing behavior problems. The indirect effect of 4-year externalizing behavior problems on 14-year adaptive functioning was not significant for Communication, standardized indirect effect = $-.10$, $p = .069$.

Covariate analyses—Potential exogenous variables and third-variable common causes considered in this analysis included child age and 4- and 10-year intellectual functioning as well as maternal education at all three ages and social desirability bias. Covariates were not included if they proved unrelated to the domain scores.

At the zero-order level, child intellectual functioning at 4 years was correlated with 4-, 10-, and 14-year adaptive functioning, $r(132) = .44$, $p < .001$, $.24$, $p < .01$, and $.28$, $p = .001$, respectively, and with 4- and 10-year externalizing behavior problems, $r(132) = -.31$, $p < .001$, and $-.20$, $p < .05$, respectively. Child intellectual functioning at 10 years was correlated with 10- and 14-year adaptive functioning, $r(132) = .40$, $p < .001$, and $.39$, $p < .001$, respectively, and 14-year externalizing behavior problems, $r(132) = -.17$, $p < .05$. Child age did not correlate with any concurrent outcome measures; mothers' education at all 3 ages did not correlate with any of the child variables, nor did mothers' social desirability bias relate to maternal reports. These candidates were excluded as covariates in the analysis. Adjusted scores of 4-, 10-, and 14-year adaptive functioning and externalizing behavior problems were computed as unstandardized residuals of domain scores partialing out their shared variance with child intellectual functioning.

Figure 2 presents the standardized solution to the final developmental cascade model using adjusted domain scores with shared variance with child intellectual functioning removed, S-B $\chi^2(9) = 13.48$, $p = .146$, robust CFI = $.99$, SRMR = $.04$. Significant 2-wave cascades, covariations, and longitudinal stabilities among adaptive functioning and externalizing and

internalizing behavior problems reported for the final model without covariates remained significant with one exception: The significant prediction from 10-year internalizing behavior problems to 14-year adaptive functioning attenuated to marginal significance with the shared variance with child intellectual functioning removed from 14-year adaptive functioning, $p = .069$. Levels of significance and the magnitude of the indirect effects remained essentially unchanged in this covariate model for the three significant 3-wave cascades.

Discussion

Adaptive behavior is conceptualized as the effectiveness with which individuals actively cope with the demands of their environments and is operationally defined as the performance of daily activities required for personal and social sufficiency. Three important principles are inherent in this definition. First, adaptive behavior encompasses age-related, normative changes and grows in complexity as individuals age. Second, adaptive behavior is defined by the expectations or standards of people around the individual. Finally, adaptive behavior reflects typical performance, not ability. An individual's adaptive behavior is inadequate if ability is not demonstrated when it is required. Adaptive functioning is central in human development and particularly meritorious of study in applied developmental science because it reflects the effective transactions of diverse biological, psychological, and social processes in relation to broad developmental goals.

Developmental Cascades

Several 2-wave and three 3-wave cascades emerged from our analyses. We first discuss the 2-wave cascades, focusing on one as an illustration. We then turn to discuss the more compelling 3-wave cascades. These developmental cascades obtained over and above covariation among the three constructs at each age and temporal rank-order stability of each across age, they obtained apart from child intellectual functioning (and were not associated with child age or maternal education or social desirability bias), and they obtained for the Adaptive Behavior Composite as well as its constituents. We defined developmental cascades as longitudinal cross-domain unique relations. Children with higher levels of adaptive functioning at 4 years exhibited fewer internalizing behavior problems at 10 years. Adaptive functioning appears to protect against the emergence and development of internalizing problems. Successful adaptive functioning portends positive consequences for children's self-perceptions or judgments that can lead over time to a healthier behavioral repertoire. More specifically, adaptive functioning could help regulate self-control, such that children in greater command of adaptive skills avoid reacting to the frustrations of daily challenges by becoming depressed and withdrawn (Cicchetti & Schneider-Rosen, 1986; Cole, 1990, 1991). Children who function adaptively likely also make positive impressions on others, whereas failures to achieve at age-salient developmental tasks can place children on maladaptive trajectories that undermine mental health (Masten et al., 2006). Lower social competence (a constituent of adaptive functioning) predicts internalizing problems across childhood over and above initial covariance of these domains in childhood and the stability of each domain (Chen Li, Li, Li, & Liu, 2000; Kiesner, 2002; Masten et al., 2005; Mesman et al., 2001; Obradovi, Burt, & Masten, 2010). In addition, children exhibiting more externalizing behavior problems at 4 years tended to display lower levels of adaptive functioning at 10 years, and more internalizing behavior problems at 10 years related to lower levels of adaptive functioning at 14 years. Moreover, more internalizing behavior problems at 4 years related to fewer externalizing behavior problems at 10 years, and more externalizing behavior problems at 4 years related to more internalizing behavior problems at 10 years.

Three significant 3-wave cascades from the present study are consistent with the definition of cascades by which functioning in one domain spreads to other domains both directly and indirectly from early childhood going forward. We discuss each briefly, and afterward circle back to discuss stability. One 3-wave developmental cascade indicated that childhood externalizing behavior problems predict diminished adaptive functioning. Put another way, young children with fewer externalizing behavior problems function more adaptively later. This finding comports with other longitudinal studies (Masten et al., 2005). Early acting out could disrupt the development of social skills and successful interpersonal relationships, and so failures of adaptive functioning might reflect antecedent disorderly behavior insofar as children who act out are less likely to acquire adaptive behaviors (Hinshaw, 1992; Masten et al., 2005, 2006; Rubin, Bukowski, & Parker, 2006).

Positive concurrent covariation is commonly observed between externalizing and internalizing behaviors (e.g., Angold et al., 1999). In the present study, we observed a second 3-wave developmental cascade in which more internalizing behavior problems predicted fewer externalizing behavior problems over time, even controlling for their positive concurrent associations. There is other evidence that, once controls for concurrent associations are instituted, internalizing behavior problems predict relatively lower risk for later externalizing behavior problems (Masten et al., 2005; Moffitt et al., 2002; Pine, Cohen, Cohen, & Brook, 2000). Perhaps behavioral inhibition diminishes risk-taking or involvement with deviant peers (Masten et al., 2005; Mesman et al., 2001; Moffitt et al., 2002; Pine et al., 2000).

Finally, adaptive functioning at 14 years was predicted by adaptive functioning at 4 years as mediated by internalizing behaviors at 10 years. This third 3-wave cascade might be thought of as somewhat weaker as it involves only two domains.

Covariation and Stability of Adaptive Functioning and Behavior Problems

At the zero-order level, adaptive functioning and externalizing behavior problems, and adaptive functioning and internalizing behavior problems, were negatively associated with one another at all ages. Externalizing and internalizing behavior problems were consistently positively correlated at the zero-order level; therefore, it is notable that the externalizing-internalizing zero-order association may be modified longitudinally once controls for their stability and prior covariation have been applied.

At the zero-order level, the three domains were also stable in themselves, and so demonstrate heterotypic stability as each was assessed by developmentally appropriate indexes from childhood to adolescence that is independent of measurement variability across time. Findings of stability tell us about the overall developmental course of a given characteristic. Moderate-to-strong zero-order stability estimates in adaptive functioning have previously been reported from childhood to early adulthood (Sparrow et al., 1984), and relatively high stability has been reported for both externalizing and internalizing behavior problems in samples from the general population (Hofstra, van der Ende, & Verhulst, 2002; Koot, 1995; Moffitt & Caspi, 2001; Sanson, Pedlow, Cann, Prior, & Oberklaid, 1996; Verhulst & Koot, 1992). Mesman and Koot (2001) reported significant stability of both externalizing and internalizing behavior problems from age 2–3 to age 10–11, and internalizing behavior problem stability reportedly spans 10-year intervals (Masten et al., 2005) and more (Obradović et al., 2010).

Strengths and Limitations

Our operationalization and assessment of developmental cascades were stringent and employed key controls, including child intelligence, maternal education, and reporter bias.

Our first assessment took place before children began school, thereby testing early-onset cascade effects. Models that account for concurrent correlations and longitudinal stability also test and reject as unlikely alternative explanations that developmental cascades are artifacts of intercorrelations that are present early and carry forward. Next to these several strengths, this study has some limitations. The normative nature of the sample (restricting the ranges of adaptive functioning and problem severity) places limits on understanding how adaptive functioning affects the development of behavior problems in clinical or at-risk populations. Although the characteristics of our sample may limit broad generalizability of the findings, our participants were socioeconomically heterogeneous, recruited over a wide SES range, and represented a demographically significant portion of the U.S. population. Our foci on broad constructs and unequal and relatively wide age spans between assessment waves precluded drawing firm conclusions about when or how observed cross-domain links developed. Due to sample size and model complexity, we did not pursue a latent variable approach, and child gender as well as some additional common cause variables and moderating constructs (e.g., temperament) were not assessed, but might have made for a more definitive study.

Conclusion

Cascade analyses hold implications for theory, prevention, and treatment. The study of directional effects, over and above covariances of domains within time and stabilities of domains across time, helps to specify processes underlying developmental adaptation, just as knowing when and how cascades occur among which characteristics promises to inform more strategic preventions and interventions (Masten et al., 2005). Our research suggests that one way to prevent deterioration in one domain (adaptive functioning) is to intervene earlier in a different domain (externalizing behavior problems). Remediating a behavior problem, even if successful, may not affect progression to long-term consequences if a cascade has already initiated. However, promoting young children's adaptive functioning might obviate internalizing behavior problems later, just as effectively addressing young children's internalizing behavior problems might prevent the outbreak of externalizing behavior problems in adolescence. Life Skills Training (Botvin & Griffin, 2004) is a school-based competence promotion program based on the theory building skills and general competencies protect youth from maladaptation. Generally, more effective interventions need to address the right domains with strategic timing and methods. Experimental tests of interventions based on cascade models promise novel and robust evidence for identifying etiology and treatment course.

This work also prompts us to consider how fundamental tasks of parenting are organized so as to ensure young children's adaptive development and minimize behavior problems. For parents, the mitigation of early poor behavioral problems promises to repay. The stability of behavior problems is considerable from 4 years on, and behavior problems may also increase in frequency with age (Hemphill, 1996; Verhulst & van der Ende, 1995), so practitioners' identification of early and potent inoculations or countermeasures is vital to promoting children's healthy development. For policy makers, strategically timed and targeted interventions designed to address behavior problems may result in a return on investment in terms of an enhanced epidemiology of more adaptively functioning adolescents (Heckman, 2006).

Acknowledgments

We thank A. Bradley and P. Horn. This research was supported by the Intramural Research Program of the NIH, NICHD. Human subject treatment in this study complied with the ethical standards defined by the American Psychological Association.

References

- Achenbach, TM. Integrative guide for the 1991 CBCL/4-18, YSR, and TRF profiles. University of Vermont Department of Psychiatry; Burlington, VT: 1991a.
- Achenbach TM, Edelbrock CS. The classification of child psychopathology. *Psychological Bulletin*. 1978; 85:1275–1301. [PubMed: 366649]
- Achenbach, TM.; Edelbrock, C. Manual for the Child Behavior Checklist and Revised Child Behavior Profile. Author; Burlington, VT: 1983.
- Achenbach, TM.; Rescorla, LA. Manual for the ASEBA school-age forms & profiles. University of Vermont, Research Center for Children, Youth, and Families; Burlington, VT: 2001.
- Angold A, Costello EJ, Erkanli A. Comorbidity. *Journal of Child Psychology and Psychiatry*. 1999; 40:57–87. [PubMed: 10102726]
- Behar L, Stringfield S. A behavior rating scale for the preschool child. *Developmental Psychology*. 1974; 10:601–610.
- Bentler, PM. EQS 6 Structural Equations Program Manual. Multivariate Software; Encino, CA: (in press)(www.mvsoft.com)
- Bentler PM. Comparative fit indexes in structural models. *Psychological Bulletin*. 1990; 107:238–246. [PubMed: 2320703]
- Bentler PM, Weeks DG. Linear structural equations with latent variables. *Psychometrika*. 1980; 45:289–308.
- Bentler, PM.; Wu, EJC. EQS for Windows User's Guide. Multivariate Software, Inc; Encino, CA: 1995.
- Botvin GJ, Griffin KW. Life skills training: Empirical findings and future directions. *Journal of Primary Prevention*. 2004; 25:211–232.
- Browne, MW.; Cudeck, R. Alternative ways of assessing model fit. In: Bollen, KA.; Long, JS., editors. *Testing structural equation models*. SAGE; Newbury Park, CA: 1993. p. 136-162.
- Chen X, Li D, Li Z, Li B, Liu M. Sociable and prosocial dimension of social competence in Chinese children. *Developmental Psychology*. 2000; 36:302–314. [PubMed: 10830975]
- Cicchetti D. The emergence of developmental psychopathology. *Child Development*. 1984; 55:1–7. [PubMed: 6705613]
- Cicchetti, D. An historical perspective on the discipline of developmental psychopathology. In: Rolf, J.; Masten, AS.; Cicchetti, D.; Nuechterlein, KH.; Weintraub, S., editors. *Risk and protective factors in the development of psychopathology*. Cambridge University Press; New York: 1990. p. 2-28.
- Cicchetti, D.; Schneider-Rosen, K. An organizational approach to childhood depression. In: Rutter, M.; Izard, C.; Read, P., editors. *Depression in young people*. Guilford Press; New York: 1986. p. 71-134.
- Cohen, J. *Statistical power analysis for the behavioral sciences*. 2nd ed. Erlbaum; Hillsdale, NJ: 1988.
- Cole DA. Relation of social and academic competence to depressive symptoms in childhood. *Journal of Abnormal Psychology*. 1990; 99:422–429. [PubMed: 2266218]
- Cole DA. Preliminary support for a competency-based model of depression in children. *Journal of Abnormal Psychology*. 1991; 100:181–190. [PubMed: 2040769]
- Cole DA, Martin JM, Powers B, Truglio R. Modeling causal relations between academic and social competence and depression. *Journal of Abnormal Psychology*. 1996; 105:258–270. [PubMed: 8723007]
- Dempster AP, Laird NM, Rubin DB. Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society B: Methodological*. 1977; 39:1–38.
- Evans MA. Reticent primary grade children and their more talkative peers: Verbal, nonverbal, and self-concept characteristics. *Journal of Educational Psychology*. 1996; 88:739–749.
- Ezpeleta L, Keeler G, Erkanli A, Costello EJ, Angold A. Epidemiology of psychiatric disability in childhood and adolescence. *Journal of Child Psychology and Psychiatry*. 2001; 42(7):901–914. [PubMed: 11693585]

- Fowler PC, Park RM. Factor structure of the Preschool Behavior Questionnaire in a normal population. *Psychological Reports*. 1979; 45(2):599–606. doi: 10.2466/pr0.1979.45.2.599.
- Greenfield PM, Keller H, Fuligni A, Maynard A. Cultural pathways through universal development. *Annual Review of Psychology*. 2003; 54:461–490.
- Heckman JJ. Skill formation and the economics of investing in disadvantaged children. *Science*. 2006; 312:1900–1902. [PubMed: 16809525]
- Hemphill SA. Characteristics of conduct-disordered children and their families: A review. *Australian Psychologist*. 1996; 31:109–118.
- Hinshaw SP. Externalizing behavior problems and academic underachievement in childhood and adolescence. *Psychological Bulletin*. 1992; 111:127–155. [PubMed: 1539086]
- Hofstra MB, van der Ende J, Verhulst FC. Child and adolescent problems predict DSM-IV disorders in adulthood. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2002; 41:182–189. [PubMed: 11837408]
- Hollingshead, AB. The four-factor index of social status. Yale University; 1975. Unpublished manuscript
- Hu L-T, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6:1–55.
- Humes, KR.; Jones, NA.; Ramirez, RR. 2010 Census Briefs, C2010BR-02. U.S. Census Bureau; Washington, DC: 2011. Overview of race and Hispanic origin.
- Johnson, TP.; Shavitt, S.; Holbrook, AL. Survey response styles across cultures. In: Matsumoto, D.; van de Vijver, FJR., editors. *Cross-cultural research methods in psychology*. Cambridge University Press; New York: 2011. p. 130-178.
- Kamphaus RW. Conceptual and psychometric issues in the assessment of adaptive behaviour. *Journal of Special Education*. 1987; 21:27–35.
- Kiesner J. Depressive symptoms in early adolescence. *Journal of Research on Adolescence*. 2002; 12:463–478.
- Koot, HM. Longitudinal studies of general population and community samples. In: Verhulst, FC.; Koot, HM., editors. *the epidemiology of child and adolescent psychopathology*. Oxford University Press; New York: 1995. p. 337-365.
- Lupien SJ, Maheu F, Tu M, Fiocco A, Schramek TE. The effects of stress and stress hormones on human cognition. *Brain and Cognition*. 2007; 65:209–237. [PubMed: 17466428]
- MacKinnon DP, Lockwood CM, Williams J. Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*. 2004; 39:99–128. [PubMed: 20157642]
- Mardia KV. Measures of multivariate skewness and kurtosis with applications. *Biometrika*. 1970; 57:519–530.
- Masten, AS. Resilience in development: Implications of the study of successful adaptation for developmental psychopathology. In: Cicchetti, D., editor. *Rochester Symposium on Developmental Psychopathology*. Vol. Vol I. The emergence of discipline. Erlbaum; Hillsdale, NJ: 1989. p. 261-294.
- Masten AS, Cicchetti D. Developmental cascades. *Development and Psychopathology*. 2010; 22:491–495. doi: 10.1017/S0954579410000222. [PubMed: 20576173]
- Masten AS, Curtis WJ. Integrating competence and psychopathology. *Development and Psychopathology*. 2000; 12:529–550. [PubMed: 11014751]
- Masten AS, Roisman GI, Long JD, Burt KB, Obradovi J, Riley JR, Tellegen A. Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology*. 2005; 41:733–746. [PubMed: 16173871]
- Masten, AS.; Burt, KB.; Coatsworth, JD. Competence and psychopathology in development. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology*. 2nd ed. Vol. Vol. 3. Wiley; New York: 2006. p. 696-738.
- Mesman J, Bongers IL, Koot HM. Preschool developmental pathways to preadolescent internalizing and externalizing problems. *Journal of Child Psychology and Psychiatry*. 2001; 42:679–689. [PubMed: 11464972]

- Mesman J, Koot HM. Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:1029–1036. [PubMed: 11556626]
- Moffitt TE, Caspi A. Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development and Psychopathology*. 2001; 13:355–375. [PubMed: 11393651]
- Moffitt TE, Caspi A, Harrington H, Milne BJ. Males on the life-course-persistent and adolescence-limited antisocial pathways. *Development and Psychopathology*. 2002; 14:179–207. [PubMed: 11893092]
- Obrodovi J, Burt KB, Masten AS. Testing a dual cascade model linking competence and symptoms over 20 years from childhood to adulthood. *Journal of Clinical Child & Adolescent Psychology*. 2010; 39:90–102. [PubMed: 20390801]
- Pine DS, Cohen E, Cohen P, Brook JS. Social phobia and the persistence of conduct problems. *Journal of Child Psychology and Psychiatry*. 2000; 41:657–665. [PubMed: 10946757]
- Platt LO, Kamphaus RW, Cole RW, Smith CL. Relationship between adaptive behavior and intelligence. *Psychological Reports*. 1991; 68:139–145.
- Reynolds WM. Development of reliable and valid short forms of the Marlowe-Crowne Social Desirability Scale. *Journal of Clinical Psychology*. 1982; 38:119–125.
- Roeser RW, Eccles JS, Sameroff AJ. School as a context of early adolescent's academic and social-emotional development: A summary of research findings. *Elementary School Journal*. 2000; 100:443–471.
- Rubin, KH.; Bukowski, WM.; Parker, JG. Peer interactions, relationships, and groups. In: Damon, W.; Lerner, RM.; Eisenberg, N., editors. *Handbook of child psychology*. 6th ed. Vol. 3. Wiley; New York: 2006. p. 571-645.
- Sanson A, Pedlow R, Cann W, Prior M, Oberklaid F. Shyness ratings: Stability and correlates in early childhood. *International Journal of Behavioral Development*. 1996; 19:705–724.
- Satorra, A.; Bentler, PM. Scaling corrections for statistics in covariance structure analysis. *UCLA Statistics Series #2*; Los Angeles: 1988.
- Satorra, A.; Bentler, PM. Corrections to test statistics and standard errors in covariance structure analysis. In: Von Eye, A.; Clogg, CC., editors. *Latent variable analysis: Applications for developmental research*. Sage Publications; Thousand Oaks, CA: 1994. p. 399-419.
- Schonfeld IS, Shaffer D, O'Connor P, Portnoy S. Conduct disorder and cognitive functioning. *Child Development*. 1988; 59:993–1007. [PubMed: 3168633]
- Sparrow, SS.; Balla, DA.; Cicchetti, DV. *Vineland Adaptive Behavior Scales survey form manual*. Interview edition. American Guidance Service; Circle Pines, Minnesota: 1984.
- Stanger C, Lewis M. Agreement among parents, teachers, and children on internalizing and externalizing behavior problems. *Journal of Clinical Child Psychology*. 1993; 22:107–115.
- Tilton-Weaver, LC.; Kakihara, F. United States of America. In: Arnett, JJ., editor. *International encyclopedia of adolescence*. Routledge; New York: 2008. p. 1061-1076.
- Tombokan-Runtukahu J, Nitko AJ. Translation, cultural adjustment, and validation of a measure of adaptive behavior. *Research in Developmental Disabilities*. 1992; 13:481–501. [PubMed: 1410714]
- U.S. Census Bureau. 2008 American community survey. 2008. Available at www.factfinder.census.gov.
- Verhulst, FC.; Koot, HM. The stability of externalizing behaviors in an epidemiological sample. In: Remschmidt, H.; Schmidt, MH., editors. *Developmental psychopathology, child and youth psychiatry: European perspectives*. Vol. 2. Hogrefe & Huber Publishers; Ashland, OH: 1992. p. 139-149.
- Verhulst FC, van der Ende J. The eight-year stability of problem behavior in an epidemiologic sample. *Pediatric Research*. 1995; 38:612–617. [PubMed: 8559618]
- Wechsler, D. *Wechsler preschool and primary scale of intelligence - revised*. Psychological Corporation; San Antonio, TX: 1989.
- Wechsler, D. *Wechsler Intelligence Scale for Children*. 3rd ed. Psychological Corporation; San Antonio, TX: 1991.

Figure 1.

Standardized solution for the developmental cascade model on the total sample. In this and the subsequent figure, within-time covariations among domains were estimated at all 3 ages but omitted from the figure to simplify the presentation; numbers associated with single-headed arrows are standardized path coefficients; arrows associated with dependent variables are error variances and represent the amount of variance not accounted for by paths in the model.

Figure 2. Standardized solution for the cascade model on the total sample with adjusted domain scores for 4-, 10-, and 14-year adaptive functioning and externalizing behavior problems removing their shared variance with child intelligence.

Table 1

Descriptive Statistics for Adaptive Functioning, Externalizing and Internalizing Behavioral Problems, and Potential Covariates at Three Ages

	4 years		10 years		14 years	
	Instrument	<i>M (SD)</i>	Instrument	<i>M (SD)</i>	Instrument	<i>M (SD)</i>
Adaptive Functioning	VABS	99.27 (11.56)	VABS	97.18 (11.82)	VABS	95.07 (13.08)
			TRF	19.56 (4.65)		
Externalizing						
Behavior Problems	PBQ: H-A	5.52 (2.82)	CBCL	7.71 (6.55)	CBCL	8.35 (6.91)
	PBQ: H-D	2.96 (1.76)	TRF	6.75 (8.72)	YSR	11.51 (6.18)
Internalizing	PBQ: A-F	3.76 (2.32)	CBCL	6.23 (5.66)	CBCL	6.97 (5.74)
Behavior Problems			TRF	6.40 (5.95)	YSR	10.83 (7.77)
Maternal Social Desirability	–	–	SDS-SF	6.49 (2.98)	SDS-SF	6.73 (2.72)
Maternal Education	HI	6.16 (0.89)	HI	6.19 (0.87)	HI	6.21 (0.86)
Child Intellectual	WPPSI-R	114.66 (15.66)	WISC III	119.90 (13.32)		
Functioning						

Note. VABS = Vineland Adaptive Behavior Scales. TRF = Teacher Report Form. PBQ = Preschool Behavior Questionnaire. CBCL = Child Behavior Checklist. YSR = Youth Self-Report. SDS-SF = Social Desirability Scale, Short Form. HI = Hollingshead Index. WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence-Revised. WISC III = Wechsler Intelligence Scale for Children, 3rd Edition.

Table 2

Correlation Matrix of Variables in the Cascade Model

	1	2	3	4	5	6	7	8	9
1. Adaptive functioning, 4 years	.69								
2. Externalizing behavior problems, 4 years	-.25 **	.68							
3. Internalizing behavior problems, 4 years	-.24 **	.47 ***	.69						
4. Adaptive functioning, 10 years	.44 ***	-.29 ***	-.09	.69					
5. Externalizing behavior problems, 10 years	-.10	.45 ***	.04	-.36 ***	.68				
6. Internalizing behavior problems, 10 years	-.34 ***	.31 ***	.21 *	-.31 ***	.50 ***	.70			
7. Adaptive functioning, 14 years	.46 ***	-.19 *	-.15	.57 ***	-.32 ***	-.35 ***	.69		
8. Externalizing behavior problems, 14 years	-.11	.27 **	.11	-.30 ***	.61 ***	.33 ***	-.26 **	.69	
9. Internalizing behavior problems, 14 years	-.20 *	.16	.26 **	-.03	.17 *	.44 ***	-.25 **	.38 ***	.69

Note. Numbers shown on the diagonal are variances. All variables were scaled by constants so that variables' variances were all approximately equal.

*
 $p < .05$;

**
 $p < .01$;

 $p < .001$.