



ELSEVIER

Available online at www.sciencedirect.com

 ScienceDirect

Journal of Adolescence 29 (2006) 857–889

Journal of
Adolescence

www.elsevier.com/locate/jado

Developmental assessment of competence from early childhood to middle adolescence

Jelena Obradović^a, Manfred H.M. van Dulmen^b, Tuppett M. Yates^a,
Elizabeth A. Carlson^a, Byron Egeland^{a,*}

^a*Institute of Child Development, University of Minnesota, 51 East River Road, Minneapolis, MN 55455, USA*

^b*Department of Psychology, Kent State University, P.O. Box 5190, Kent, OH 44242, USA*

Abstract

This study represents a developmentally informed, empirically validated examination of competence across multiple domains (Social, Cognitive, Emotional well-being), gender and age (early childhood, middle childhood, early adolescence, middle adolescence). Competence indicators were created and the structure of these domains was tested using multi-method, multi-informant data collected on 191 participants drawn from a prospective study of at-risk children. The results indicated that inter-individual differences in Cognitive and Social competence were stable across time, whereas inter-individual differences in Emotional well-being were stable only between early and middle adolescence. While the strength of stability of Cognitive competence was similar across different time points, the stability of Social competence declined after middle childhood, suggesting more inter-individual variability with regard to change. The findings also indicated that both the structure and the stability of competence are similar for boys and girls.

© 2006 The Association for Professionals in Services for Adolescents. Published by Elsevier Ltd. All rights reserved.

Keywords: Competence; Positive adaptation; Measurement; Stability

*Corresponding author. Tel.: +1 612 624 5273; fax: +1 612 624 6373.

E-mail address: egela001@umn.edu (B. Egeland).

Introduction

Since its inception, the field of psychology has struggled to define and assess human adaptation and development. Historically, however, research has emphasized maladaptation and psychopathology, to the relative exclusion of positive developmental outcomes. Moreover, initial efforts to examine positive development tended to adopt an overly simplistic definition of competent adaptation as the absence of psychopathology. Burgeoning interest in positive psychology has extended early conceptualizations of positive developmental adaptation as the absence of clinically significant symptomatology to encompass a more dynamic, assets-oriented, developmental view of competence (e.g. Glantz & Johnson, 1999; Linley & Joseph, 2004; Masten & Garmezy, 1985).

Transcending early deterministic models, the integrative science of developmental psychopathology has advanced our dynamic understanding of both typical and atypical human development over the past 30 years (Cicchetti, 1984; Cicchetti & Cohen, 1995; Sameroff, 2000; Sroufe & Rutter, 1984). As the cornerstone of developmental psychopathology, the organizational theory of development provides a conceptual framework that fosters an understanding of adaptation as a multi-dimensional developmental process (Sroufe, Egeland, Carlson, & Collins, 2005). In this view, *competence* refers to the effectiveness and the quality of individual adaptation as it reflects the adaptive use of internal and external resources to enable the successful negotiation of developmentally salient issues (Cicchetti & Schneider-Rosen, 1986; Masten, Burt, & Coatsworth, 2006; Waters & Sroufe, 1983). These issues transcend multiple domains (e.g. cognitive, social, emotional) and vary both in salience and appearance across different developmental periods. For example, basic physiological regulation is especially salient in infancy because it lays the foundation for emotional and behavioral regulation, which take on increasing importance as the child moves into the preschool period and social interactions with peers become more prominent. Organizational theory informs how and why we must expect and accommodate changing markers of competence over time (Sroufe et al., 2005).

Despite a growing emphasis on the multi-dimensionality of competence, extant research within a developmental psychopathology framework has typically identified individual predictors of domain-specific competence at discrete points in time. These studies are limited in their capacity to inform our understanding of relations among and within competence domains over time. Researchers interested in processes underlying adaptation have begun to examine how various dimensions of competence inter-relate and change over time (Luthar, Doernberger, & Zigler, 1993; Masten et al., 1995). However, such dynamic models of adaptation are scarce because they require longitudinal, course-oriented analyses of competence domains, repeatedly assessed and analyzed in a developmentally appropriate way (Egeland, Carlson, & Sroufe, 1993; Luthar, 1991; Masten, Best, & Garmezy, 1990). Moreover, the research to date has relied mostly on theoretically defined domains of competence to the relative exclusion of empirical validation (Sesma, Mannes, & Scales, 2005). As discussed later, empirically validating competence measures that reflect developmental change and complexity presents a formidable challenge for contemporary statistical paradigms that require equivalent measures across time.

The present study aims to address the pressing need for developmentally informed, empirically validated examinations of competence across multiple domains, groups and time points. It employs a rich longitudinal data set to propose specific theoretical and empirical processes by

which researchers can identify developmentally appropriate indicators of age-salient competence domains in order to examine their structure and dynamic patterning over time.

Competence as a multi-dimensional construct

As defined by the organizational theory of development, competence is evidenced by the successful negotiation of developmental issues that are widely recognized among members of a particular society, culture and generation as salient for children of a given age period (Masten & Coatsworth, 1998; Sroufe et al., 2005; Yates & Masten, 2004). Within Western models of adaptation and achievement, core dimensions of competence are manifold, as are the tasks to which such competencies are applied (Havighurst, 1952; Klaczynski, 1990; Masten & Coatsworth, 1995; Waters & Sroufe, 1983). However, social, cognitive and emotional dimensions of adaptation consistently emerge as central domains of competence. Beginning with the earliest exchanges in the dyadic caregiver–infant relationship, extending into the social world of peers and, ultimately, to friends and romantic partners, social aspects of competence remain salient determinants of adaptation across the developmental continuum (Sroufe, Egeland, & Carlson, 1999). Similarly, cognitive capabilities play an integral role in early capacities to selectively attend and independently and persistently explore new stimuli, as well as in more formalized developmental tasks such as the acquisition of basic intellectual and regulatory abilities in school and in the transition to work and young adulthood (Blair, 2002; Cumberland-Li, Eisenberg, & Reiser, 2004; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Roisman, Masten, Coatsworth, & Tellegen, 2004).

Empirical studies of competence frequently overlook core aspects of Emotional well-being, particularly as related to representations of the self as deserving of care and support, and as having agency and efficacy. Yet concepts such as self-esteem, agency, positive affect, enthusiasm and pride in one's work are critical determinants of psychosocial adaptation (Harter, 1999; Henderson & Dweck, 1990; Skinner, 1995; White, 1959). For example, Rutter (1985) has emphasized that self-esteem, self-confidence, self-efficacy and flexible problem-solving strategies are all essential determinants of positive adaptation in the face of adversity.

Furthermore, researchers are only beginning to call our attention to “the existence of overt behavioral competence along with the covert psychological distress” (Luthar & Zelazo, 2003, p. 539), underscoring the importance of studying both aspects of competent functioning (Luthar & Cicchetti, 2000). Several studies demonstrate this decoupling of external and internal adaptation indices. For example, Zucker et al. showed that children of alcoholics who were classified as resilient in preschool years demonstrated an upsurge of internalizing problems throughout childhood and adolescence. By early adolescence, they exhibited a level of internalizing problems significantly higher than the level of non-challenged peers who were positively adapted in preschool, and indistinguishable from that of vulnerable peers who were maladaptive in preschool (Zucker, Wong, Puttler, & Fitzgerald, 2003). Similarly, Hetherington and Elmore (2003) showed that girls raised in divorced, mother-headed households who otherwise seemed to be especially well-adjusted and socially responsible suffered from low self-esteem and increased levels of depression and anxiety.

There are several reasons why internal aspects of competence are frequently overlooked. First, developmental theorists disagree about whether judgments regarding competence should include internal processes or solely rely on external behavioral criteria (Masten, 2001). Second, due to the

evolving nature of this competence construct—variously known as internal, emotional or psychological well-being—the terminology surrounding it remains ambiguous. Moreover, methods for assessing Emotional well-being are scant and often rely on subjective self-report, which can be too volatile for longitudinal study of stability and change. Finally, society at large appears more concerned with the obvious costs linked to overt behavior problems, such as antisocial behaviors, delinquency and school dropout, than with the less visible costs of individual internal distress. Nevertheless, the growing awareness of internal well-being as a salient aspect of competence that does not necessarily track the more explicit indices of adaptation indicates the need for examination of Emotional well-being as a primary constituent of competent functioning over time (Cicchetti & Toth, 1994; Harter, 1999; Luthar & Zelazo, 2003; Luthar & Zigler, 1991).

While recognizing the probable multiplicity of competence dimensions, as well as the range of conceptualizations present within each dimension, this study empirically identifies and examines patterns of competence in the following domains: (1) Social, (2) Cognitive and (3) Emotional well-being.¹ These domains represent core aspects of adaptation, but by no means do they exhaust the list of relevant competence domains.

Developmental appropriateness of competence indicators

The theoretical conceptualization of competence dimensions influences how competence domains are longitudinally operationalized. From an organizational perspective, even though a competence domain may remain theoretically and conceptually consistent over a period of time, developmentally appropriate indicators may change dramatically across the developmental continuum. *Developmental appropriateness* of an indicator refers to the validity of the measured construct—the extent to which it reflects age-specific manifestations of behavior. For example, in early childhood the construct of Social competence may focus on initiating and maintaining social interactions surrounding concrete goals; while later in middle childhood and adolescence this competence domain may include deep, intimate friendships built on mutual trust, loyalty, emotional support and self-disclosure (Furman & Bierman, 1984; Hartup, 1992; Newcomb & Bagwell, 1995; Rubin, Bukowski, & Parker, 1998). As such, indicators of peer Social competence in early childhood may include observational data documenting the child's effective transition from parallel play to interactive play, whereas in adolescence indicators of the same underlying competence construct may be drawn from interviews with adolescents about their close, intimate friendships (Collins & Roisman, 2006; Furman, 1996). In addition to the qualitative features of competence indicators, quantitative aspects of behavior change in predictable ways over time. For example, research shows that as adolescents get older, there is a developmentally normative increase in the time they spend with their peers (Larson & Richards, 1994; Steinberg & Morris, 2001; Youniss & Smollar, 1985). Since appropriate indicators of competence dimensions change both quantitatively and qualitatively over the course of development, it is inappropriate for measures to remain the same across different developmental periods.

¹Given that this remains a relatively new area of research with numerous and competing terminologies, we chose to call this domain emotional well-being because it best describes the constructs that we measured (e.g., self-esteem, pride, agency, positive affect, etc.).

These developmental changes present a challenge to researchers seeking to conceptualize, operationalize and assess competence domains over the course of development. The present study endeavors to tackle two central challenges of employing a developmental approach to the longitudinal study of competence. First, we identify developmentally sensitive indicators of domain-specific competence across multiple developmental periods by drawing on the extant competence literature and the authors' developmental expertise. Second, within the constraints of current statistical paradigms, we endeavor to model and confirm the structure of competence both within and across the periods of early childhood, middle childhood, early adolescence and middle adolescence.

Longitudinal stability of competence

Within an organizational framework, development is understood to reflect a process of successive reorganizations, such that prior forms of adaptation, modified by later life experience, become hierarchically integrated into new adaptational patterns, yielding a more complex, flexible and organized system (Egeland et al., 1993; Sroufe, 1979; Sroufe & Rutter, 1984). This continuous qualitative reorganization ensures that adaptive (or maladaptive) responses to prior experience are incorporated into later forms of functioning (Werner & Kaplan, 1964) in a probabilistic, rather than deterministic, way (Egeland et al., 1993; Sroufe & Rutter, 1984). Accordingly, competence, as an indicator of positive adaptation, measures the extent to which an individual is able to adaptively negotiate contemporaneous challenges, and it reflects both current circumstance and the individual's history of competence with respect to earlier developmental tasks (Sroufe, 1997; Yates, Egeland, & Sroufe, 2003). The way a child negotiates early developmental milestones provides a foundation for future encounters with age-salient issues. Thus, there is developmental coherence over time, such that early competence may facilitate successful achievement of new developmental tasks, whereas unsuccessful achievement of early developmental challenges (i.e. prior lack of competence) may compromise the child's ability to achieve competence in later developmental tasks (Cicchetti & Schneider-Rosen, 1986; Sroufe, 1997; Sroufe & Rutter, 1984).

As applied to the current study, this organizational framework suggests that systematic change in both behavioral and emotional competence indicators is probable, but the nature of this change remains to be further explored. Although some studies show continuity in competence over time (Sroufe, Egeland, & Kreutzer, 1990), others indicate that patterns of competent functioning may not be continuous, perhaps varying as a function of outside influences, such as life stress (Egeland & Kreutzer, 1991). This study examines patterns of stability and change in Social competence, Cognitive competence and Emotional well-being across four time points, from early childhood, through middle childhood, early adolescence and middle adolescence.

Structural invariance of competence

Researching the processes underlying adaptation often extends to investigating how diverse individual and contextual factors affect levels of competence. Numerous studies have explored group differences, comparing competence averages across various groups of children: girls vs. boys, low SES vs. high SES, maltreated vs. non-maltreated, high risk vs. low risk and others (e.g.

Brooks-Gunn, Duncan, & Maritato, 1997; Egeland, 1997; Egeland, Sroufe, & Erikson, 1983; Gutman, Sameroff, & Eccles, 2002; McLoyd, 1998). Less attention, however, has been paid to the possibility that there is structural variance in the composition of competence domains across different groups. This is particularly concerning because establishing structural invariance of competence domains is a prerequisite for testing group means (e.g. Bontempo, Hofer, & Lawrence, in press; Meredith, 1993). If the structure of competence indicators differs across two groups—that is, if the strength of factor loadings for the indicators comprising the measure of a competence domain varies at statistically significant levels across the groups—it is impossible to establish whether mean differences result from genuine differences in the level of competence or from an underlying disparity in the structure of competence. Similarly, despite a growing interest in examining stability in competence levels across time, hardly any work has evaluated how the longitudinal stability of competence dimensions compares across different groups and developmental periods.

The effects of individual differences on the structural invariance of competence domains and the strength of their stability remain to be explored. Accordingly, this study evaluates gender invariance of the competence structure as well as gender differences in the strength of stability of competence domains over four developmental periods. We begin by investigating whether the structure of competence is similar for boys and girls at different developmental periods. Next, we examine whether the pattern of stability for each competence domain differs for boys and girls across four developmental periods. Finally, we test whether the strength of stability across all developmental periods is analogous for boys and girls. For example, we test whether the level of stability of a certain domain between early and middle childhood varies from the level of stability of the same domain between early and middle adolescence, and, further, whether longitudinal stability of inter-individual differences differs across gender groups.

Summary

In sum, the main goals of this study are (1) to theoretically identify and empirically validate developmentally appropriate indicators of age-salient competence dimensions; (2) to test the stability of these competence dimensions across four time points, from early childhood, through middle childhood and early adolescence, to middle adolescence; and (3) to investigate the gender invariance of the structure and stability of competence domains over time. This study provides an important theoretical and empirical contribution to the extant literature as it constitutes a rare effort to prospectively examine the stability of empirically validated measures of competence dimensions while exploring gender invariance of both competence structure and longitudinal stability.

Methods

Participants

Participants for this study were drawn from the Minnesota Longitudinal Study of Parents and Children, a prospective study of children developmentally at-risk due to the low socioeconomic

status of their families (Egeland & Brunquell, 1979). The study began with a sample of 267 primiparous mothers and their firstborn children who were recruited from public health clinics between 1975 and 1977. The sample for the current study included 191 children (86 females, 105 males) who remained in the study past 2 years of age. That age was used as a cut-off because the highest attrition occurred during the first 2 years of the study. From age 2 to age 16, attrition was only 8.9%. In the present sample, the mother's age at the time of delivery ranged from 12 to 34 years ($M = 20.58$, $S.D. = 3.74$). Fifty-nine percent of these mothers were single and 36% had not completed high school. While the majority of mothers were Caucasian (82.7%), 12% were African American, and the remaining 5.2% were American Indian, Latino or Asian. Participants identified themselves as 66% Caucasian, 11.5% African American, 16.8% Mixed Race, 2.1% American Indian, Latino or Asian, and 3.7% did not identify their ethnic origin.

Variable selection criteria

The goal of the current study was to examine the structure and longitudinal trends of positive adaptation by creating developmentally appropriate indicators of age-salient competence domains and evaluating their stability and invariance over time. With this aim in mind, variables were chosen for inclusion in the study based on the following criteria: (a) measures were originally designed to assess a full range of positive adaptation (i.e. not presence or absence of psychopathology), (b) measures assessed the individual child's functioning independent of the caregiver-child dyad, (c) variables reflected the quality of adaptation within theoretically identified competence domains, and (d) assessments were conducted during one of four relevant developmental periods. The initial set of variables represented domains of Social competence, Cognitive competence and Emotional well-being across four developmental periods: (a) early childhood, when participants were between 42 and 54 months of age (Time 1), (b) middle childhood, when participants were in first, second and third grade (Time 2), (c) early adolescence, when participants attended sixth grade (Time 3) and (d) middle adolescence, when participants were 16 years old (Time 4).

The coherence of each group of initial variables was empirically evaluated within each domain at each time point. Scale reliabilities were calculated for all variables belonging to each domain within the same developmental period, and individual indicators were removed to strengthen the overall cohesiveness of the designated variable group. Next, we selectively reduced the number of competence indicators in each group to accommodate the limitations of our sample size. Therefore, identical measures that were repeated within the same developmental period were composited (e.g. teacher ratings in first, second and third grade). Since this approach applied only to middle childhood, we also developed an empirical procedure using exploratory and confirmatory factor analyses to determine which groups of variables could be further composited. This procedure and subsequent analyses are explained in detail in the results section. Here, we describe measures used to identify relevant developmentally appropriate competence indicators.

The measures in this study include a wide array of assessments using multiple methods and informants, including teacher reports, parent reports, child reports, direct observations in home, school, and summer camp environments, standardized assessments of intellect and behavior, and projective measures of personality and representation. All observational assessments were coded by independent teams of multiple coders who were blind to the developmental histories of the

participants. Therefore, the present variables constitute longitudinally unbiased measures of competence. The measure descriptions included in the Appendix are organized in alphabetical order and are intended to supplement the organizational structure of variables representing competence domains at each developmental period presented in Table 1.

Table 1
Descriptive statistics for measures of competence domains

Time and domain	Measure	Indicators	Range	<i>M</i>	S.D.	<i>N</i>
T1 Social	PIPS	Peer relationship quality	1–5	3.10	1.10	167
	PRS	Social skill	1–7	3.84	1.34	96
T1 Cognitive	LOR	Focus scale	1–5	3.38	1.29	166
	PLS	Verbal ability score	46–168	105.83	21.47	173
		Language score	59–163	107.60	19.63	171
T1 Emotional well-being	BB	Positive affect	1–5	2.78	.90	185
		Agency	1–6	3.41	1.29	184
		Self-esteem	1–7	3.36	1.56	183
	CB	Positive affect	1–7	3.52	1.52	174
		Agency	1–7	4.27	1.57	174
		Self-esteem	1–7	3.75	1.48	174
	PRS	Positive affect	2–7	4.60	1.40	96
		Agency	1–7	4.43	1.63	96
	T2 Social	TIR	Leadership skills composite, $\alpha = .74$			
1st grade			1–5	2.78	1.01	188
2nd grade			1–5	2.56	1.08	184
3rd grade			1–5	2.57	1.15	188
Child cooperation composite, $\alpha = .59$						
1st grade			1–5	3.06	.93	188
2nd grade			1–5	2.98	.93	186
3rd grade			1–5	3.56	1.00	188
Social competence composite, $\alpha = .67$						
2nd grade			1–5	2.70	1.00	188
3rd grade (with adults)			1–5	2.84	1.01	188
Work in groups composite, $\alpha = .64$						
2nd grade			1–6	3.75	1.12	187
3rd grade			1–6	3.87	1.14	188
DEV			Peer cooperation composite, $\alpha = .62$			
	2nd grade	2–14	8.96	2.49	179	
	3rd grade	3–14	8.85	2.47	186	
HAR	Peer competence composite, $\alpha = .64$					
	1st grade	6–24	16.44	5.08	185	
	3rd grade	6–24	16.20	5.41	185	
T2 Cognitive	DEV	Work organization composite, $\alpha = .76$				
		1st grade	4–26	16.92	5.02	98

Table 1 (continued)

Time and domain	Measure	Indicators	Range	<i>M</i>	S.D.	<i>N</i>
		2nd grade	3–26	16.16	5.40	179
		3rd grade	4–26	16.38	5.14	186
		Perseverance composite, $\alpha = .58$				
		2nd grade	2–12	7.29	2.42	180
		3rd grade	2–12	7.60	2.35	186
	TIR	Persistence composite, $\alpha = .75$				
		1st grade	1–6	3.83	1.53	189
		2nd grade	1–6	3.75	1.57	187
		3rd grade	1–6	3.81	1.49	188
		Independence composite, $\alpha = .76$				
		1st grade	1–6	3.81	1.49	189
		2nd grade	1–6	3.65	1.43	187
		3rd grade	1–6	3.89	1.36	188
		Attention: 3rd grade	1–6	3.91	1.15	187
		Ability to express self composite, $\alpha = .78$				
		1st grade	1–6	4.11	1.23	189
		2nd grade	1–6	4.11	1.34	187
		3rd grade	1–6	4.03	1.19	188
	PIAT	PIAT grade score composite, $\alpha = .95$				
		1st grade	65–135	109.53	14.93	177
		2nd grade	65–135	107.57	11.98	174
		3rd grade	65–135	105.82	12.07	177
	HAR	Cognitive composite, $\alpha = .78$				
		1st grade	6–24	15.85	5.73	185
		3rd grade	6–24	16.47	4.95	185
	HOR	Compliance composite, $\alpha = .64$				
		1st grade	1–5	4.39	.91	169
		2nd grade	2–5	4.41	.85	165
		3rd grade	2–5	4.54	.75	176
		Task orientation composite, $\alpha = .67$				
		1st grade	1–5	4.07	.92	169
		2nd grade	2–5	4.11	.88	163
		3rd grade	2–5	4.13	.80	176
		Persistence composite, $\alpha = .66$				
		1st grade	1–5	3.92	.99	169
		2nd grade	2–5	4.08	.89	164
		3rd grade	1–5	3.93	.86	176
T2 Emotional well-being	TIR	Pride composite, $\alpha = .54$				
		1st grade	1–6	4.26	1.16	189
		2nd grade	1–6	4.15	1.18	187
		3rd grade	1–6	4.10	1.13	187
		Enjoyment composite, $\alpha = .63$				
		1st grade	1–6	4.42	1.06	190
		2nd grade	1–6	4.21	1.09	187
		3rd grade	1–6	4.22	1.13	188

Table 1 (continued)

Time and domain	Measure	Indicators	Range	<i>M</i>	S.D.	<i>N</i>	
T3 Social	TR	Peer competence	3.23–100	54.52	29.08	185	
	TIR	Social competence with adults	1–6	3.17	1.02	186	
		Work in groups	1–6	4.08	1.21	186	
	DEV	Peer cooperation	2–14	9.28	2.52	185	
T3 Cognitive	DEV	Work organization	4–26	16.46	5.37	185	
		Perseverance	2–12	7.37	2.54	185	
	TIR	Persistence	1–6	3.94	1.54	186	
		Works independently	1–6	4.13	1.31	186	
		Concentration	1–6	3.95	1.27	186	
		Motivation	1–6	3.92	1.28	186	
		Use of time	1–6	3.76	1.43	186	
		Verbal expression	1–6	4.28	1.12	186	
		Written expression	1–6	3.72	1.31	186	
	PIAT	PIAT grade score	65–125.8	100.87	10.55	180	
T3 Emotional well-being	SC	Self perception	1–6.5	3.68	1.25	179	
		Investment in activity	1–7	2.80	1.57	179	
		Affective tone	1–6	3.67	1.12	179	
		Peer relation attitudes	1–6.5	3.65	1.34	179	
T4 Social	TR	Peer competence	3.33–100	51.09	25.91	177	
	TIR	Leadership skills	1–7	3.58	1.44	176	
		Work in groups	1–5	3.10	1.14	173	
		Social competence with adults	1–7	4.42	1.46	177	
	FI	Friendship quality composite, $\alpha = .89$					
		Friendship closeness	1–7	4.30	1.48	165	
		Friendship security	1–7	4.86	1.39	165	
T4 Cognitive	WJ	Comprehension score	470–554	519.02	12.92	166	
		Calculation score	480–576	534.10	16.49	163	
	TIR	Persistence	1–5	3.08	1.40	175	
		Work independently	1–5	3.21	1.29	174	
		Concentration	1–5	3.05	1.23	174	
		Motivation	1–5	2.97	1.32	175	
		Use of time	1–5	2.89	1.26	173	
		Verbal expression	1–5	3.32	1.10	175	
		Written expression	1–5	3.02	1.13	173	
T4 Emotional well-being	TIR	Enthusiasm for learning	1–5	2.99	1.22	174	
		Self-esteem	1–5	3.99	1.49	176	

Notes: *N* = 191; BB—Barrier Box, CB—Curiosity Box; DEV—Devereux Elementary School Behavior Rating Scale; FI—Friendship Interview; HAR—Harter Teacher Rating Scale of Actual Competence and Acceptance; HOR—Home Observer Rating; LOR—Laboratory Observer Rating; PIAT—Peabody Individual Achievement Test; PIPS—Preschool Interpersonal Problem-Solving Interview; PLS—Preschool Language Scale; PRS—Preschool Rating Scales; SC—Sentence Completion; TR—Teacher Rankings; TIR—Teacher Interview Ratings; WJ—Woodcock–Johnson.

Missing data

Descriptive statistics for individual indicators are presented in Table 1. In situations where variable distributions had a kurtosis value greater than 2 and a skewness value greater than 7 (Curran, West, & Finch, 1996), transformations were conducted according to Tabachnick and Fidell (2001, p. 89). Due to diverse methods and variable measurement scales, all variables were standardized before any composites were created. For the exploratory factor analyses, missing data were handled using listwise deletion within each time point and specific domain of investigation. For the confirmatory factor analyses and latent variable modeling, missing data were estimated using the imputation procedure with an Expected Maximization algorithm (Allison, 2002) in PRELIS 2.54.

Results

The statistical analyses were conducted sequentially according to the three main goals of this study: (1) to identify the indicators of competence during early childhood, middle childhood, and early and middle adolescence, (2) to investigate the stability of competence across these four age periods and (3) to investigate whether the structure of competence across different age periods is similar for boys vs. girls (gender invariance). Exploratory factor analyses were conducted in SPSS 12.0 and PRELIS 2.54. Confirmatory factor analyses and analyses of invariance were completed using the statistical program LISREL 8.54.

Exploratory factor analysis

We began by conducting exploratory factor analyses using variables previously identified as belonging to the same competence domain and age period. These analyses were conducted to determine which variables could be further composited, thus reducing the overall number of competence domain indicators. If a specific domain had only one indicator (e.g. T1 Social), exploratory factor analyses were not conducted, as the number of indicators could not be further reduced. Maximum Likelihood estimation was used because it is the estimation method most commonly used in covariance analyses (Hoyle & Panter, 1995), and it is robust to minor violations of multi-variate normality (Chou & Bentler, 1995). We used an oblique (promax) rotation because it was hypothesized, based on an organizational perspective, that competence factors would be inter-correlated. As expected, the factors all correlated at levels of $r = .30$ or higher ($p < .05$). The number of unique factors was determined using an approach where models with a greater number of factors were not pursued if eigenvalues dropped below 1 (Tabachnick & Fidell, 2001). If standardized factor loadings exceeded .3, variables were retained; if variables had loadings lower than .3 on any factors in the factor solution, the factor analysis was replicated without these variables. The cut-off point at .3 was considered to represent a significant loading in that there was 9% overlapping variance between the factor and variable. Higher loadings reflect that the variable is a more precise measure of the factor than low loadings (Tabachnick & Fidell, 2001). To avoid overestimation errors and item cross-loadings, variables that shared either the same informant or the same method and whose Pearson correlation equaled or exceeded the value

.72 were composited. A cut-off of .72 was used because this indicated that variables shared at least 50% (.72²) of the variance. This was the case for teacher measures of Cognitive competence during early and middle adolescence. At Time 3, teacher interview ratings of the student's persistence, ability to work independently, concentration, motivation and use of time were all composited with the teacher's Devereux rating of work organization and perseverance ($\alpha = .97$). Similarly, at Time 4, teacher interview ratings of the student's persistence, ability to work independently, concentration, motivation and use of time were combined ($\alpha = .95$). Exploratory factor analysis was repeated separately for each competence domain at each developmental period. The results of these analyses are presented in Table 2.

Confirmatory factor analysis

After we composited variables according to the results of the exploratory factor analyses, the new structure of competence domains was tested separately for each developmental period using confirmatory factor analyses. However, for Time 3, we did not conduct an additional CFA, as the three constructs all had single indicators. In other words, the variables exactly reflected the factors at Time 3. As with the exploratory factor analyses, we assumed that the factors were distinct, but related. This was modeled by inter-correlating the variance components of the latent variables.

All of the standardized parameter estimates were statistically significant at $p < .05$ (see Table 2). Model fit statistics for each time period are presented in Table 3.² The overall model fit was determined using global fit indices, including the Comparative Fit Index (CFI), Goodness of Fit Index (GFI) and the Root Mean Square Error of Approximation (RMSEA). CFI and GFI values greater than .90 are considered an acceptable fit, whereas values greater than .95 are considered a good fit (McDonald & Ho, 2002). RMSEA values between .05 and .08 represent an acceptable fit, whereas a good fit is indicated by values less than .05 (McDonald & Ho, 2002), and values in excess of .10 represent poor fit (Kenny, 2003). Results in the table indicated that the model represented the data well *although* the RMSEA values were somewhat large, particularly for Time 4. One of the reasons for the discrepancy between the RMSEA and other fit indices was that the RMSEA is directly a function of the sample size, therefore making precise numerical cut-off values problematic (Steiger, 2000).

To further investigate the three-dimensional structure of competence at each time point, we compared a one-factor model (representing that competence is unidimensional) with the three-factor model results from Table 3. Since these models were nested (i.e. all manifest variables were included in both models), we used the χ^2 difference test to investigate which model best represented the data. However, it is important to note that the difference in degrees of freedom between the one- and three-factor models does not exactly reflect the difference in degrees of freedom in having the indicators load on one vs. three factors, because the three-factor model includes few inter-correlated error terms among the manifest indicators (i.e. five at Time 2 and two

²Modification indices indicated model improvement when accounting for associations among the error terms of manifest indicators. While being sensitive to problems of overfitting, some of these associations may represent meaningful information (i.e. indicators that load on different factors but are derived from the same source, such as a teacher interview). Based on the information from the modification indices, we intercorrelated five sets of error terms among manifest indicators at Time 2 and two sets of error terms at Time 4.

Table 2
Exploratory and confirmatory factor analyses of competence indicators

Time	Domain	Factors	Indicators	EFA λ	α	CFA λ
1	Social	1	PIPS: Peer rating	n/a	1 item	.60
		2	PRS: Social skill	n/a	1 item	.53
	Cognitive	1	LOR: Focus composite	n/a	1 item	.48
		2	PLS: Language/verbal composite	n/a	1 item	.51
	Emotional well-being	1	BB: Positive affect	.62	.71	.53
			BB: Agency	.58		
			BB: Self-esteem	.99		
		2	CB: Positive affect	.53	.80	.38
			CB: Agency	.92		
			CB: Self-esteem	.78		
3	PRS: Positive affect	.55	.76	.68		
	PRS: Agency	.78				
2	Social	1	TIR: Leadership skills composite	.74	n/a	.74
		2	TIR: Child cooperation composite	.72		
			TIR: Soc. competence with adults composite	.78		
			TIR: Work in groups composite	.81		
			DEV: Peer cooperation composite	.97		
			HAR: Peer competence subscale composite	.59		
	Cognitive	1	DEV: Work organization composite	.87	.94	.89
			DEV: Perseverance composite	.93		
			TIR: Persistence composite	.96		
		2	TIR: Independence composite	.75	.82	.96
			TIR: Ability to shift attention	.63		
			PIAT: Grade score composite	.86		
	3	HAR: Cognitive subscale composite	.83	.87	.34	
		TIR: Ability to express self composite	.56			
		HOR: Compliance composite	.94			
		HOR: Task orientation composite	.86			
	HOR: Persistence composite	.70				
Emotional well-being	1	TIR: Pride composite	n/a	1 item	.78	
	2	TIR: Enjoyment composite	n/a	1 item	.87	
3	Social	1	TR: Ranking of peer competence	.77	.87	1.00
			TIR: Social competence with adults	.89		
			TIR: Work in groups	.87		
			DEV: Peer cooperation	.63		
	Cognitive	1	Teacher composite (see text)	.70	.79	1.00
			TIR: Verbal expression	.57		
			TIR: Written expression	.92		
			PIAT: Grade score	.60		
	Self-esteem	1	SC: Self perception	.90	.80	1.00
			SC: Investment in activity	.30		
		SC: Affective tone	.92			

Table 2 (continued)

Time	Domain	Factors	Indicators	EFA λ	α	CFA λ	
4	Social	1	SC: Peer relation attitudes	.80	.87	.99	
			TR: Ranking of peer competence	.81			
			TIR: Leadership skills	.58			
			TIR: Work in groups	.88			
			TIR: Social competence with adults	.77			
	Cognitive	2	FI: Quality of friendship composite	.67	1 item	.22	
			1	WJ: Comprehension score	.94	.74	.52
				WJ: Calculation score	.57		
			2	TIR: Teacher composite (see text)	.94	.83	.92
				TIR: Verbal expression	.66		
TIR: Written expression	.78						
Emotional well-being	1	TIR: Enthusiasm for learning	n/a	1 item	.75		
	2	TIR: Self-esteem	n/a	1 item	.81		

Notes: $N = 191$; BB—Barrier Box, CB—Curiosity Box; DEV—Devereux Elementary School Behavior Rating Scale; FI—Friendship Interview; HAR—Harter Teacher Rating Scale of Actual Competence and Acceptance; HOR—Home Observer Rating; LOR—Laboratory Observer Rating; PIAT—Peabody Individual Achievement Test; PIPS—Preschool Interpersonal Problem-Solving Interview; PLS—Preschool Language Scale; PRS—Preschool Rating Scales; SC—Sentence Completion; TR—Teacher Rankings; TIR—Teacher Interview Ratings; WJ—Woodcock–Johnson.

Table 3

Summary of confirmatory factor analysis fit statistics for three factor solutions

Model	χ^2	df	CFI	GFI	RMSEA
T1: Early childhood	29.39	11	.96	.96	.09
T2: Middle childhood	13.25	6	.99	.98	.08
T4: Late adolescence	14.72	4	.99	.98	.12

at Time 4). In other words, the difference in degrees of freedom is partially affected by the inter-correlated error terms in the three-factor model.

Results indicate that for Time 1 the three-factor model represented the data significantly better than a one-factor model, $\chi^2_{\text{change}}(3) = 113.21, p < .001$. Likewise, for Time 2, results indicated that a three-factor solution represented the data better than a one-factor model, $\chi^2_{\text{change}}(8) = 100.83, p < .001$. Similarly for Time 4, the three-factor model represented the data significantly better than a one-factor model, $\chi^2_{\text{change}}(5) = 52.96, p < .001$. These findings suggest that at different ages competence is not a unidimensional but a multi-dimensional construct with unique, but related components.

Longitudinal stability of competence

Having established the structure of competence at each time point, we investigated the stability of competence. We examined whether inter-individual differences in previous levels of competence

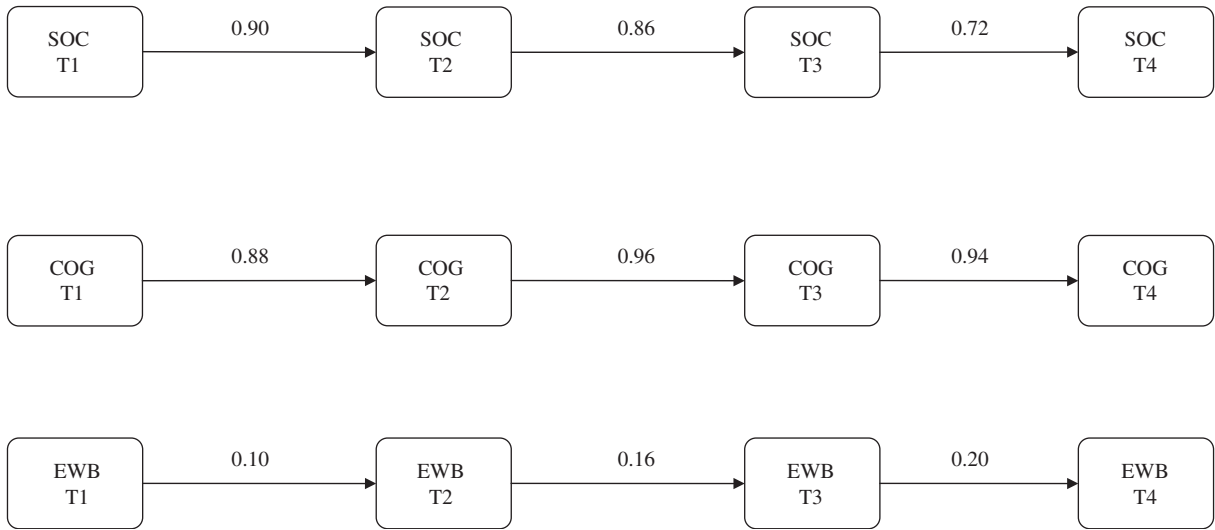


Fig. 1. Stability of Cognitive, Social and Emotional well-being Competence Domains. Notes: SOC = Social competence, COG = Cognitive competence, EWB = Emotional well-being; T1 = Early childhood (42–64 months), T2 = Middle childhood (Grades 1–3), T3 = Early adolescence (Grade 6), T4 = Middle adolescence (age 16).

were associated with inter-individual differences in later levels of competence within a specific conceptual domain (see also Rudinger, Andres, & Rietz, 1991; Wohlwill, 1973).

Results of the longitudinal analyses demonstrated high stability across all four time points for the Social and Cognitive competence domains and only partial stability during adolescence for the Emotional well-being domain (see Fig. 1). With regard to the Social competence domain, Time 1 Social competence was strongly associated with Time 2 Social competence ($\beta = .90, p < .01$), Time 2 Social competence was strongly associated with Time 3 Social competence ($\beta = .86, p < .01$) and Time 3 Social competence was associated with Time 4 Social competence ($\beta = .72, p < .01$). The stability model represented the data well (RMSEA = .06, GFI = .97, CFI = .99). To further investigate the relations across time, we tested a nested model in which all path coefficients were set to be equal using the χ^2 difference test. Follow-up analyses indicated that constraining the path coefficients between time points significantly worsened the model, $\chi^2_{\text{dif}}(2) = 81.18, p < .001$. Additional analyses indicated that putting equality constraints on *any* combination of the three path coefficients significantly worsened the model, suggesting that the stability of Social competence across time *varies* between different time points. Given the strength of the standardized path coefficients, stability of Social competence seems to decline steadily from early childhood to middle adolescence.

Similar results were revealed for Cognitive competence. Time 1 Cognitive competence was highly predictive of Time 2 Cognitive competence ($\beta = .88, p < .01$), Time 2 Cognitive competence was highly predictive of Time 3 Cognitive competence ($\beta = .96, p < .01$) and Time 3 Cognitive competence was highly predictive of Time 4 Cognitive competence ($\beta = .94, p < .01$). The stability model represented the data well (RMSEA = .07, GFI = .96, CFI = .98). However, the model in which relations were set to be equal over time did not fit the data significantly differently than the

model where the relations across time were freely estimated, suggesting that the stability of Cognitive competence across different time points was similar.

With regard to Emotional well-being, results indicated that statistically significant relations existed from Time 3 to Time 4 ($\beta = .20, p < .05$), but not from Time 1 to Time 2 or Time 2 to Time 3. In addition, the fit of this longitudinal model was between poor and adequate (RMSEA = .12, GFI = .92, CFI = .86). Follow-up analyses indicated that constraining the path coefficients between time points significantly worsened the model, $\chi^2_{\text{dif}}(2) = 6.83, p < .05$. Additional analyses indicated that putting equality constraints on *any* combination of the three relationships significantly worsened the model, suggesting that the stability of Emotional well-being across time *varies* across different time points.

Invariance by gender

Analyses were conducted to investigate whether the strength of the factor loadings (weak invariance) was similar for boys and girls (e.g. Grouzet, Otis, & Pelletier, 2006; Vandenberg & Lance, 2000). Two different models were compared, one in which the factor loadings between the two groups were free to vary and a second model in which they were constrained to be equal between the two groups. With regard to Time 1 (early childhood), results indicated that loadings were similar for boys and girls, $\chi^2(7) = 12.03, p > .05$. Likewise, results indicated that the strength of the factor loadings was similar for boys and girls at Time 2, $\chi^2(7) = .66, p > .05$ and Time 4, $\chi^2(6) = 10.14, p > .05$. These findings suggest that the structure of competence was similar for boys and girls. Finally, we conducted analyses to investigate whether the stability of competence was similar for boys and girls. Results indicated that the stability of competence was similar for boys and girls for each competence domain across all developmental periods. The size of standardized path coefficients never differed more than .06 for boys vs. girls.

Discussion

The results of this study support the general principles of the organizational theory. We found that competence is (1) a multi-dimensional construct; (2) stable in terms of inter-individual differences in the Social and Cognitive domains across four developmental periods, even though there are some indications that the level of stability may vary between time periods; and (3) gender invariant in terms of its structure and stability over time. In addition, this study illustrates the advantages and challenges of using a developmental perspective to measure competence over time.

Developmentally appropriate indicators of competence at different age periods

The goal of this study was to articulate a process for deriving developmentally appropriate indicators of three salient competence domains for the periods of early and middle childhood and early and middle adolescence. The first step was to identify potential developmentally appropriate measures of theoretically defined competence domains using developmentally rich, prospective data. Guided by an organizational theory of development with its emphasis on salient

developmental issues (Sroufe, 1979; Sroufe & Rutter, 1984), we selected competence measures with an explicit understanding that indices of adaptation must change to accommodate developmental transformations over time.

For example, we measured Social competence in early childhood by assessing basic social skills displayed during the child's play with peers, such as taking turns, sharing toys, showing empathy, initiating and maintaining interactions. Later, during middle childhood and early adolescence, the indices of Social competence changed to include more sophisticated social skills, such as peer cooperation, the ability to work in groups, perspective taking, interpersonal communication skills, leadership qualities, social competence with adults, having clearly identifiable friends and the acceptance and respect of peers. Finally, in middle adolescence, we modified our measures of Social competence to further reflect developmental change by assessing adolescents' own evaluations of their friendships' security, mutuality, openness, availability and supportiveness, as well as how close, meaningful and sincere they felt these friendships were.

Likewise, our indices of Cognitive competence systematically varied with developmental changes across the four age periods. In early childhood, we assessed Cognitive competence through standardized measures of verbal expression and by observing the child's ability to follow specific directions, focus attention and work independently on the laboratory task at hand. As the child entered the school system, however, teachers became the most appropriate informants of cognitive capacities, and so we relied on teachers' ratings of the student's academic skills, work organization, perseverance, persistence, concentration, motivation and ability to work independently. Teacher ratings were supplemented in middle childhood with home observations of the child's compliance, attention, engagement and persistence during testing. Cognitive competence was also assessed using standardized academic achievement tests of reading and mathematics.

Appropriate assessment of Emotional well-being presented a formidable challenge because of the subjective component of this domain and the dearth of appropriate measures available. We employed objective ratings of participants' Emotional well-being because subjective assessment of one's own Emotional well-being requires a certain level of insight not always present in early childhood, and because subjective reports could be influenced by circumstances immediately surrounding the assessment (Davis-Kean & Sandler, 2001; Heatherton & Wyland, 2003). Objective ratings were expected to yield a more accurate reflection of the general sense of Emotional well-being exhibited by the child over the designated age period. In early childhood, Emotional well-being was assessed using observers' rating of the child's agency, confidence, vigor, positive affect, enthusiasm, excitement, interest and self-esteem during completion of laboratory tasks, and analogous preschool teachers' observations of the child's agency, self-assertion, self-confidence, feelings of effectiveness, enjoyment, emotional depth and stability in the classroom. In middle childhood, we used teachers' perceptions of the student's pride in schoolwork and enjoyment of learning. In early adolescence, we used the coder's ratings of the adolescent's subjective sense of her/himself as worthy, effective, invested, confident, happy and content, as expressed through a spontaneous sentence completion task. Lastly, in middle adolescence, Emotional well-being was determined using the high school teacher's assessment of the student's enthusiasm for learning, as well as the adolescent's satisfaction and realistic confidence in her or his abilities and reasonable response to both praise and criticism.

Identifying measures that assess competence domains in a developmentally appropriate fashion was the first challenge in evaluating the degree of positive adaptation within and across time. Next, identified measures were grouped into cohesive and meaningful units in order to decrease the number of indicators of each domain. A series of exploratory factor analyses was used to empirically construct indicators of three competence domains across four age periods using our developmentally appropriate measures of competence.

Not surprisingly, items assessing various conceptually related but distinct behaviors tended to cluster according to the method of assessment and/or the identity of the informant (e.g. teacher vs. parent), confounding the source of information with the conceptual relatedness of rated behaviors. For example, teacher ratings of children's competence assessed by means of interview questions and behavior questionnaires (i.e. Devereux) tended to be associated strongly in our study. This could be the case because diverse aspects of competence naturally co-occur in individuals, because the measures themselves correlate strongly over time, and/or because informants see the participant in the general light of "competent" vs. "incompetent" children. These findings raise important measurement questions that warrant further investigation. Multi-method, multi-informant research is needed in order to disentangle which effects are due to informant and method variance and which reflect actual developmental phenomena.

Despite these important methodological considerations, we constructed developmentally appropriate indicators of Social, Cognitive and Emotional well-being aspects of competence from early childhood through middle adolescence. Using these theoretically informed and empirically constructed indicators, our next goal was to empirically validate the structure of the three competence domains for each of the four developmental periods. Validating the competence structure for each developmental period confirmed our expectation that competence is a multi-dimensional construct. We found that both childhood and adolescent levels of positive adaptation are better captured by three distinct, but related competence domains than by a single global construct. This study is among the first to empirically demonstrate and validate the multi-dimensional structure of competence using prospective developmental data. Having shown that these competence domains form distinct, but related aspects of global adaptation during each age period, we were able to investigate the stability of each domain across the four developmental intervals.

Stability of competence domains across the four different developmental periods

The results of our longitudinal analyses demonstrated stability of inter-individual differences in Social and Cognitive competence across four developmental periods. Early childhood levels of competence explained a significant portion of competence in the same domain during middle childhood, which in turn accounted for a significant portion of variability in the same competence domain during the next developmental period and so forth. Our data support the basic organizational principle of coherence. Prior adaptations contributed to the quality of subsequent adaptations (i.e. stability) such that developmental pathways became increasingly robust over time as previous adaptations were systematically incorporated into subsequent patterns.

However, these results do *not* imply that the level of stability of competence domains was equivalent from early childhood across middle childhood and early adolescence to middle adolescence. Indeed, the analyses testing the equality of the between-time path coefficients

revealed that the stability of Social competence *declined* after middle childhood, suggesting more inter-individual variability with regard to change. During the transition from early to middle childhood, variability of inter-individual differences was negligible. As children enter adolescence, the greater scope of social experiences and the unfolding of relationships with peers may contribute to increased inter-individual differences, thus decreasing the magnitude of stability during the transition to early and middle adolescence.

In contrast, the level of stability of Cognitive competence remained high across all four developmental periods. This is not surprising given the cumulative nature of cognitive skills and academic achievements. Further, the fact that indicators of Cognitive competence tend to be more objective than indices of Social competence or Emotional well-being, due to standardized means of assessment, may also contribute to the high longitudinal stability of Cognitive competence.

Finally, we found significant stability of Emotional well-being only between early and middle adolescence. Inter-individual differences in terms of Emotional well-being did not predict the variability of Emotional well-being at earlier time points beyond what was due to chance. The lack of stability seems counterintuitive given that the organizational theory of development postulates that over time prior forms of competence are hierarchically integrated into current levels of competence (Sroufe et al., 2005). On the other hand, the lack of stability may be related to methodological considerations such as the underlying nature of the indices used to assess Emotional well-being. For example, indices such as self-esteem tend to be unstable over longer periods of time and are influenced by developmental transitions and current life experiences (Hanna, 2002; Seidman & French, 2004; Trzesniewski, Donnellan, & Robins, 2003). Moreover, various measurement issues—differences in subjective and objective perspectives, the lack of good standardized measures and the importance of having closer intervals of assessment—may further confound these results. Since our measures of Emotional well-being contained the smallest number of indicators across time and included only objective report, it is hard to determine whether the lack of stability reflects a conceptual difference or a methodological artifact.

Gender invariance of competence structure and stability

Finally, our results demonstrated that during each developmental period, Social, Cognitive and Emotional well-being dimensions of competence were structurally invariant with regard to gender. In other words, the significance of each developmentally appropriate indicator comprising the structure of competence domains did not vary across the two gender groups. Even though our data suggest that the competence structure is the same for boys and girls, there may be meaningful gender differences with respect to the mean level of competence. Gender invariance of competence structure is a necessary prerequisite for testing whether boys and girls differ in their level of competence across different domains and age periods. In addition, we found that both the pattern and strength of competence stability did not vary across the two gender groups. The extent to which inter-individual differences in competence domains wax and wane across the four developmental periods was analogous for boys and girls. Nevertheless, these findings need to be replicated using larger, more representative data sets before we can draw any conclusions regarding gender invariance of competence structure and stability. Examining gender invariance represents only an initial attempt to understand how individual differences can affect the structure and the stability of positive adaptation.

Limitations

A longitudinal study that spans multiple age periods and assesses numerous developmental phenomena in great detail provides an invaluable source of information for studying the processes underlying positive adaptation. At the same time, the practical constraints inherent in such a study necessarily qualify the interpretation of our findings. Multi-method, multi-informant assessments yield in-depth comprehensive data, but this quality of information occurs at the expense of the quantity of participants and in some cases the clarity of our interpretations. For example, the data from the current study provided a wealth of information on competence during early and middle childhood, but for practical purposes, we a priori constructed variables that composited information across different time points that shared the same methods of assessment (e.g. grade 1, grade 2 and grade 3 teacher assessments of peer cooperation). These aggregations may have compromised the reliability of our constructs. Since our sample is limited in size and scope, our findings provide important directions that need to be further explored and replicated using data sets with larger sample sizes. Similarly, the benefits of having a thirty-year-old prospective study sometimes may be balanced by the limited availability of valid, standardized measures that span several developmental periods at the time the study began. However, the paucity of such measures still exists, particularly with respect to assessing positive adaptation. For the purposes of this study, we felt that assembling developmentally appropriate indicators using various measures would yield a better measure of competence than using a single measure that mostly focuses on symptom count, indicating lack of psychopathology rather than presence of positive adaptation. Lastly, during adolescence our assessment points took place every few years, leaving unexplored gaps in the developmental continuum that should be investigated using studies with more frequent assessment periods.

Our study offers important insights regarding the longitudinal patterning of competence over time; however, it is important to recognize that stability coefficients do not measure intra-individual variability and change. Indicators that change with time in order to appropriately capture development present a problem for studying intra-individual continuity and change over time. When measures are modified to accommodate developmental change, we do not know if statistical change in competence levels is due to developmental processes or to alternate methods of assessment. In addition, drawing developmentally appropriate indicators from multiple measures, while adding to the richness of the data, requires that all items be standardized before being averaged into a composite measure of competence. This procedure is necessary because different measures employ various response scales, and standardizing items ensures that each source of information will be equally weighted. However, standardizing measures artificially removes any degree of change that might occur over time.

Another significant challenge derives from the fact that many developmentally appropriate measures of competence rate children in comparison to their age mates. During certain developmental periods, we asked teachers and observers to rate participants in comparison to classroom peers or to other participants in the study. This presents a problem for studying intra-individual change because the differences measured over time indicate change in relative standing rather than absolute change in individual competence level. Observer ratings will under- or overestimate individual competence levels if the study sample is not representative of the larger population. Likewise, classroom comparison samples can change with every grade,

potentially yielding an artificial relative change in competence level when no absolute change has occurred.

There is inherent conflict in researchers' need for both measurement consistency and developmental flexibility. One approach to studying the longitudinal change of competence domains while measuring domains in developmentally appropriate ways is to focus on shorter intervals of time during which the construct is developmentally stable and thus can be assessed with the same indicators. Researchers can thus simply collect identical repeated measures of a competence construct. However, it is not enough to proclaim theoretically that the construct does not change developmentally. In order to establish that the structure of competence is truly consistent over time, it is important to test the longitudinal structural invariance of the competence domain. In other words, if ten items measure the specific competence domain at *T1*, the loading of each item at *T1* needs to be not significantly different from the loading at *T2* in order for the domain to be structurally invariant over time. Otherwise, it is unclear whether there is a bona-fide change in the level of competence or whether the change is the result of certain items carrying more weight at *T2*. Unfortunately, this solution limits the scope of what we can study by narrowing the window of longitudinal study to the period for which a measure remains structurally invariant and by impeding the use of multi-method, multi-informant data. Our study points to the pressing need for empirically valid measures of competent adaptation across time, which would have enough overlapping items to permit analyses to equate the measure across time.

Conclusions

This study illustrates a process for developing and validating theoretically and statistically informed indicators of competence across time. We also highlight issues associated with this approach and challenges that remain, due to the competing demands of a developmental perspective and current statistical analyses of longitudinal change. The investigation highlights the need for future research in this area as well as the specific decision points confronting researchers interested in designing a study of competence across time.

The results demonstrating that these competence domains are invariant across gender and stable over time in terms of Social and Cognitive domains suggest important future research directions. Since competence structure appears to be invariant across gender, the next step will be to explore group differences in terms of competence levels. In general, researchers need to further examine how diverse individual differences and life experiences could affect both the structure and the level of different competence domains. Knowing which risk and protective factors are associated with either the level of competence or its stability across time and whether the effects of these factors are similar across different aspects of adaptation and remain equally salient across developmental periods has important implications for both prevention and intervention efforts.

Another line of future research should focus on investigating inter-relations among different domains of adaptation within the same age period and over time. We are particularly interested in examining if change in one competence domain is associated with change in other competence domains over time and vice versa. Understanding the relation of competence in one domain to the course of competence in other domains is an important theoretical question with a great potential to influence clinical practice (Masten et al., 1995). For the same reason, we think that it is important to have more studies that explore how competence differs from psychopathology and

how competence and psychopathology interact over time (Masten et al., 2005). In explicating these methodological issues in the study of competence within a developmental framework, we hope to guide and encourage researchers who currently have access to appropriate longitudinal data sets to join in the challenge of studying positive adaptation over time.

Acknowledgments

This research was supported by a grant from the National Institute of Mental Health (MH40864-20) to the fifth author. Preparation of the manuscript was also supported by the Eva O. Miller Fellowship from the University of Minnesota to the first author and a National Science Foundation Fellowship to the third author.

Appendix

Measures

Barrier Box (Time 1: Emotional well-being). At 42 months, each child's behavior was examined in response to a barrier box challenge task developed by Harrington, Block, and Block (1978). Children were presented with a latched, Plexiglas box containing attractive toys. For 10 minutes the child was allowed to try to open the box to play with the toys inside and/or to play with a set of less attractive toys on the floor. Observer ratings of Agency, Positive Affect and Self-Esteem were used as indicators of early childhood Emotional well-being in this study.

The 6-point Agency rating reflected the degree of confidence, vigor and force with which the child attacked the problem—the projected sense of personal power. The rating was based on quality of effort rather than number of attempts. A child scoring high on this scale was forceful, confident and vigorous and manifested some instances of straining or diligence, whereas a low-scoring child evidenced minimal effort to get to the toys inside the box. (Repeated, insistent “I can't” indicated a lack of confidence, especially if they occurred in the context of weak efforts.) The 5-point Positive Affect scale captured the child's enthusiasm, delight and excitement as displayed by her/his liveliness, facial affect, quality of vocalization and interest in the toys at the end of the session. While a child scoring high on the scale exemplified these qualities, the child scoring low may have had a completely flat or bland affect and showed no excitement or interest in the box or other toys. The 7-point Self-Esteem scale reflected the degree to which the child approached the task with interest, curiosity and enthusiasm. In general, a child scoring high on this scale exhibited a high degree of self-control, confidence and involvement as demonstrated by constructive, positive attempts to deal with the challenge and engagement with other toys. A child scoring low on this scale was unable to stay organized and constructive and may have shown a marked lack of confidence and/or inability to cope with the situation (e.g. cried, persisted in seeking contact with the mother or experimenter, or became hyperactive, destructive, depressed or withdrawn).

Barrier Box ratings of Agency, Positive Affect and Self-esteem differ significantly between maltreatment and control groups (Egeland, Sroufe, & Erikson, 1983), and across infant

attachment classification groups (Arend, 1984). Inter-rater reliability coefficients for ratings of Agency, Positive Affect and Self-esteem were .91 ($n = 60$), .83 ($n = 60$) and .92 ($n = 25$), respectively.

Curiosity Box (Time 1: Emotional well-being). A modified version of Banta's (1970) Curiosity Box Assessment assessed the child's curiosity and exploration at 54 months of age. The child was presented with a brightly painted, attractive, rectangular box containing a number of manipulative elements (e.g. hinges, locks, Slinky), tactile elements (e.g. sandpaper) and peepholes and interior chambers for exploration. The child's initial reaction to the box as well as the quality of the subsequent 10-min exploration was evaluated using 7-point behavioral rating scales. Rating scales of Agency, Positive Affect and Self-esteem were used as indicators of Emotional well-being in early childhood. As in the Barrier Box, the Agency scale indicated the child's projected sense of efficacy and mastery reflected in interactions with the box. The Positive Affect scale reflected the child's affective expression ranging from enthusiastic to depressed or withdrawn. The Self-esteem scale indicated the extent to which the child's behavior was comfortable and confident or disorganized and attention-seeking. Ratings of Agency, Positive Affect and Self-Esteem distinguished competent and incompetent groups based on 42 month observations (Nezworski, 1983). Inter-rater reliability coefficients for ratings of Agency, Positive Affect and Self-Esteem across 50 cases were .90, .81 and .86, respectively.

Devereux Elementary School Behavior Rating Scale (Times 2, 3: Social, Cognitive). The Devereux Elementary School Behavior Rating (DESB II) was designed by Spivack and Swift (1982) primarily for use by elementary school teachers as a means of identifying and describing classroom behaviors. In grades 1, 2 and 3, teachers were asked to rate the child on 50 behavior items. Ratings compared the participant to the typical or "average" child in a regular classroom on either a 5-point frequency scale from "very frequently" to "never," or a 7-point similarity scale from "extremely" to "not at all." The child was scored on 10 behavior factors and four behavior clusters that were derived from factor analysis of the 50 items. The 10 behavior factors consisted of three and five items while the four behavior clusters consisted of two–four items. Normative data for this measure were obtained for each grade (K-6). While no reliability data were reported for the regular class sample, 1-week test–retest coefficients (median factor correlation = .81) were reported for a random sample of special education children. Validity data consisted of correlations between factor scores and scores on measures of achievement (e.g. California Achievement Test), an IQ test, teacher reports and ratings of achievement. The data varied widely across factors, but correlations generally support the validity of the measure.

In the current study, Work Organization (behavior factor) and Perseverance (behavior cluster) composite variables from grades 1, 2 and 3 were used as indicators of middle childhood Cognitive competence. The Peer Cooperation (behavior cluster) variables from grades 1, 2 and 3 were included as an indicator of Social competence. Identical measures were averaged across grades to reduce the number of indicators. Sixth grade Work Organization and Perseverance were used as measures of Cognitive competence, and the Peer Cooperation variable was used as an indicator of Social competence in the early adolescent period.

Friendship Interview (Time 4: Social). The Friendship Interview, which is part of a modified identity interview (Grotevant & Cooper, 1981), is a semi-structured interview used to assess the quality of adolescents' non-romantic, best friend relationships. Interview transcripts were coded according to eight relationship rating scales designed to assess general expectations of friendships

as well as specific perceptions, feelings and attitudes regarding close relationships. All interview transcripts were coded by at least two judges and final ratings represented conferenced scores. This study used averaged 7-point scales measuring Friendship Security and Friendship Closeness as an indicator of adolescent Social competence. This composite was developed based on factor analytic work with various subscales of the age 16 Friendship Interview. Results of the factor analyses indicated that friendship security and closeness were empirically similar to each other but distinct from the other indicators of friendship relationships (e.g. friendship conflict resolution) (Collins & van Dulmen, *in press*). The Friendship Security scale measured authenticity, mutuality, openness of communication (particularly about distress), availability, help and durability of adolescent friendships. At the high end of the scale, friendship communication was characterized as open and friends could be relied upon to be supportive. At the low end of the scale, friendship exchanges involved actively withholding information, avoiding difficult issues or indirectly communicating, if at all, desires for support or negative reactions like embarrassment, irritation and anger. The Friendship Closeness scale captured the adolescent's perspective on how close s/he felt toward the friend. A high score reflected a meaningful relationship in which friends had developed profound, sincere feelings for one another. Low scores were assigned to relationships characterized as replaceable or obligatory. Friendship security ratings were correlated significantly with concurrent interview-derived friendship commitment ratings, $r(157) = .51$, $p < .001$ (Grotevant & Cooper, 1981), and camp counselor peer competence rankings, $r(40) = .40$, $p < .01$ (Carlson, Sroufe, & Egeland, 2004). Spearman Brown inter-rater reliability coefficients for the Friendship Security and Closeness scales were .74 and .84, respectively.

Harter Teacher Rating Scale of Actual Competence and Acceptance (Time 2: Social, Cognitive). The Teacher's Rating Scale of Actual Competence and Acceptance (Harter, 1979) was developed by Harter and Pike to complement the child's rating of perceived competence and acceptance. This measure was administered when participants were in first and third grade. Teachers were asked to evaluate the child on six cognitive (e.g. "good at spelling," "good at numbers") and peer (e.g. "has friends to play with", "gets asked to play by others") competence descriptors using a 4-point scale ranging from "not true" to "very true." In this study, the Peer Competence subscale total score was used as a Social competence indicator and the Cognitive subscale total score was identified as a Cognitive competence measure.

Home Observer Ratings (Time 2: Cognitive). During middle childhood (grades 1, 2 and 3), participants were visited at home, where researchers interviewed primary caregivers and administered a battery of tests to the children. At the end of the home visit, the examiner completed 5-point scale ratings of the child's approach to a structured task (e.g. WPSSI, PIAT, Draw-A Person). This study used composites of first, second and third grade ratings on the following scales as indicators of Cognitive competence in middle childhood. The Compliance scale measured the degree of the child's compliance or non-compliance with examiner instructions. A high score was given to a child who complied promptly with virtually all directions, although s/he may have shown some hesitancy or attempted to negotiate the examiner's demands, especially if tired, frustrated or interested in pursuing another activity. A low score was given to a child who expressed non-compliance through anger, overt negativism or by ignoring examiner instructions. The Task Orientation scale measured the child's attention and engagement during testing. A high score was assigned to a child who consistently attended to all aspects of the task and concentrated on each item of the test, whereas a low score was given to a child who, despite persistent efforts by

the examiner to engage her/him in the task, did not attend for more than a few seconds, appeared distracted, actively avoided the task or seemed to daydream. The Persistence scale measured the amount of effort the child put into solving the test problems. A child who attempted to solve even the most difficult items received a high score, whereas a child who gave up on the task almost before s/he began was assigned a low score.

Laboratory Observer Ratings (Time 1: Cognitive). Observer ratings of the child's overall functioning were completed during a 54-month laboratory assessment that included the Lowenfeld Mosaic, Gender Identity, Competing Set, Focus and Delay of Gratification Tasks (Block & Block, 1973). Following the examination, each child was rated on a 5-point scale that measured attentional focus. The Focus scale rating was used as an indicator of Cognitive competence. The rating represents the child's ability to focus attention on the task at hand, follow specific directions, operate independently when required, assess the situation and complete the task. A high-scoring child was seen as focused and systematic in approaching the tasks. This child easily followed directions, remained absorbed in the tasks, ignored minor distractions and quickly returning to the task after any interruption. A low score reflected a highly distractible, unfocused, impulsive child who either moved quickly from one thing to the next or required a lot of examiner prodding.

Peabody Individual Achievement Test (PIAT) (Times 2, 3: Cognitive). The PIAT designed by Dunn and Markwardt (1970) was administered when children were in first, second, third and sixth grades. The purpose of the PIAT was to provide a wide-range screening measure of achievement in five areas: mathematics, reading recognition, reading comprehension, spelling and general information. The test provides individual results in the form of an age score, grade equivalency, percentile ranks and standard scores for each of the five subtests. For the purposes of this study, averaged first, second and third grade standard scores were used as indicators of middle childhood Cognitive competence and the corresponding sixth grade score was used as a measure of early adolescent Cognitive competence. Concurrent validity was obtained by the authors by correlating scores of the PIAT with IQ scores from the Peabody Picture Vocabulary Test. Correlations ranged from .42 in kindergarten to .69 in grade three. Sattler (1982) reports the concurrent validity of the PIAT, using a variety of achievement and ability tests in a variety of populations as "excellent." Test-retest reliability is reported to be .89 (total), which is generally better than reliabilities for individual subtests. Test-retest reliabilities of separate subtest raw scores ranged from .42 in Spelling to .94 in the Reading Recognition subtest.

Preschool Inter-personal Problem-Solving Interview (Time 1: Social). The Preschool Inter-personal Problem-Solving Interview (Shure & Spivack, 1974) was administered when participants were 4½ years old to assess their expectations, attitudes and feelings about relationships. The interview uses a standardized format to assess the preschool child's ability to resolve real-life inter-personal dilemmas related to peer and parent-child relationships. For this study, a theoretically derived 7-point rating of Peer Relationship Quality was used as an indicator of early childhood Social competence (Carlson et al., 2004). High scores on the representational Peer Relationship Quality scale were assigned for solutions that incorporated positive approaches such as coordination of play (e.g. "take turns," "share toys") and/or expectations of empathy between play partners. Low scores were assigned for responses characterized by conflict and the use of control or force or by withdrawal and helplessness. Intraclass inter-rater reliability was .72 ($N = 167$).

Preschool Language Scale (Time 1: Cognitive). The Preschool Language Scale developed by Zimmerman, Steiner, and Pond (1979) was administered when the participants were 42 months old to assess auditory comprehension and verbal expression. In this study, verbal expression scores were used as an indicator of early childhood Cognitive competence. Zimmerman et al. (1979) reported a median split-half reliability coefficient of .88 (range of .75–.92), while concurrent validity, determined by patterns of correlations with linguistic and intelligence measures, ranged from .29 (with the Utah Test of Language Development) to .70 (with the Stanford Binet).

Preschool Rating Scales (Time 1: Social, Emotional well-being). Preschool Rating Scales were designed by project staff for use by preschool teachers to assess children on an array of developmentally salient issues at age 54 months. For this study, three 7-point scales related to Social Skills, Agency and Positive Affect were used. The Social Skills scale was used as an indicator of Social competence during the early childhood period. The Agency and Positive Affect scales were used as indicators of Emotional well-being. Because only one teacher completed the rank orders for each participant, inter-rater reliability coefficients were not available for this measure.

The Social Skills scale represented the degree to which the child is able to interact well with peers by being responsive and enthusiastic, successful at initiating and maintaining interactions through elaboration and modification of play themes, and by being accepted by other children as a playmate and a friend. A child scoring high on this scale was very successful across all aspects of Social competence, whereas a child scoring low probably had no real friends or regular playmates, tended to alienate other children through a lack of social responsiveness or arbitrary conduct in play, and was usually socially isolated or permitted to play only in limited ways by other children.

The Agency scale assessed children's psychological sense of self-assertion, the belief in the effectiveness of their personal powers to change a situation and to determine the outcome of an activity. A child with a high agency rating exhibited high levels of self-esteem and self-confidence, readily becoming involved in a challenging task. A child low in agency demonstrated feelings of ineffectiveness in dealing with environmental obstacles and either avoided the challenge or tackled it with low persistence and a lack of vigor and purposefulness.

The Positive Affect scale evaluated the warmth and positive quality of a child's affective states as well as the coordination between these states and the child's expressive behavior. A child with a high positive affect score was not only happy and expressive but displayed a balanced and enduring emotional condition. A low score was assigned to children who characteristically reacted to events with flat, restrained or inappropriate affect, who frequently did not seem to be enjoying their experiences or who were doing so only in a superficial fashion that seemed not to reflect a depth of feeling.

Sentence Completion (Time 3: Emotional well-being). The 28-item Sentence Completion Task was administered at age 11 (grade 6) to assess the child's attitudes and perceptions regarding central developmental issues. The participant was asked to complete a series of ambiguous sentence stems. Specific instructions were provided to encourage spontaneous responding. Seven 7-point rating scales were developed by staff to assess attitudes and expectations toward peer relationships, affective quality of relationship with parents, perception of self, affective tone, perception of school experience, investment in activities and interests, awareness and interest in the world beyond the self, and global adaptation.

Four scales were used in this study as indicators of Emotional well-being: Peer Relationship Attitudes, Self-Perception, Investment in Activity and Affective Tone. The Peer Relationship Attitudes scale was intended to assess the child's attitudes and expectations regarding close peer relationships. A high score reflected the child's confidence and enthusiasm about friendship, whereas a low score indicated a sense of isolation or one-sided relationship accompanied by distress and tension. In contrast to a measure of observed behavior, this measure captures the coder's assessment of the child's subjective sense of her/himself as worthy (or unworthy) and effective (or ineffective) in the social world. The Self-Perception scale was intended to assess the child's internal working model of self. High ratings reflected a sense of positive identity and worthiness, along with a strong sense of self-potency/self-efficacy. Low ratings were assigned for perceptions of self as unworthy and/or inadequate (e.g. responses characterized by self-criticism/self-reproach, dependency upon others for approval). The Investment in Activities scale measured the degree to which the child was engaged in a chosen interest (e.g. the frequency of the child's reference to and the intensity of her/his expressed enthusiasm for activities or interests). The Affective Tone scale was designed to capture the overall affect projected by the child throughout the protocol. A high score reflected positive feelings, a sense of happiness and contentment; a low score reflected negative, angry, despondent or highly anxious responses. Peer Relationship, Self-Perception and Affective Tone ratings have been related to concurrent counselor ratings and rankings of social skill and emotional health (Ramirez, Carlson, Gest, & Egeland, 1991). Inter-rater reliabilities coefficients were .79, .77, .85 and .76 for scales of Peer Relationship Attitudes, Self-Perception, Investment in Activities and Affective tone, respectively ($N = 179$).

Teacher Ranking (Times 3, 4: Social). The Teacher Nomination/Ranking Procedure was designed by project staff to obtain information from the classroom teacher about the target child's Social competence relative to classroom peers. The procedure was employed as a means of calibrating the hundreds of teacher ratings and classroom setting variations. In grade 6 and high school, teachers were asked to rank order all students based on a written behavioral description of preadolescent and adolescent adaptive relationship qualities. Criteria for high rankings included observed sociability, wide acceptance and respect among peers (e.g. child's ideas and actions were followed; others chose to be with the child), clearly identifiable friendships (e.g. special companions), social skills (e.g. perspective taking and inter-personal communication skills) and leadership qualities. Peer Competence rankings were recorded as a ratio of the inverse of the child's rank divided by the number of students in the class. For example, a child ranked 11th in a class of 30 received a score of .66 $[(30 - 11 + 1)/30]$. The reliability and validity of this procedure have been supported by findings of Connolly and Doyle (1981). Since only one teacher completed a rank order for each participant at each grade level, inter-rater reliability coefficients were not available for the longitudinal sample. However, the teacher rankings showed moderate continuity from year to year (i.e. $r = .45 - .55$, $p < .001$), and in a separate study, intraclass reliability coefficients for camp counselor Peer Competence rankings ranged from .60 to .80, $p < .001$ (Hiester, Carlson, & Sroufe, 1993; Sroufe et al., 2005).

Teacher Interview (Times 2, 3, 4: Social, Cognitive, Emotional well-being). Teacher interviews developed by project staff were administered when participants were in grades 1, 2, 3, 6 and 10. All interviews followed a similar format with several questions altered to reflect developmental status. Teachers were asked to rate the participants in comparison to a "typical" child in the current grade of the participant. In cases where the child had more than one teacher, the

homeroom teacher was interviewed. In high school, the English teacher was interviewed. Teachers were asked a series of questions designed to assess the child's general cognitive skills, work/study habits, social/emotional functioning and general adjustment to the larger classroom situation. For the purposes of this study, questions related to Social, Cognitive and Emotional well-being competence domains were used.

Grade 1, 2 and 3 data were used to create middle childhood (Time 2) measures representing Social, Cognitive and Emotional well-being competence domains. Indicators of Social competence included 5-point ratings of the child's leadership skills and cooperation in group activities during all three grades and 6-point ratings of the child's ability to work in groups during the second and third grade. The third-grade teacher's assessment of the child's overall social and emotional adjustment with adults supplemented peer ratings. Indicators of Cognitive competence included 6-point ratings of the child's ability to express her/himself, to work independently and to be persistent in completing work. The third grade teacher's 6-point rating of the child's ability to shift from one task to another was also added to the measure of Cognitive competence. Indicators of self-worth in middle childhood included 6-point ratings of the child's pride in her/his work and enjoyment of learning. Within the same developmental period, repeated equivalent measures were composited to reduce the number of indicators.

For the early adolescent period (Time 3), sixth grade data were used to create Social and Cognitive competence indicators. The 6-point scale rating of student ability to work in groups was used as an indicator of Social competence, and ratings of student persistence, concentration, motivation, ability to work independently and ability to express oneself verbally and in written work were used to measure Cognitive competence.

High school teacher interview ratings (Time 4) were used to represent Social and Cognitive competence and self-worth in the middle adolescent period. Five-point ratings of the adolescent's ability to work in groups, together with 7-point ratings of the adolescent's leadership skills and the quality of overall social and emotional behavior in interaction with adults, were considered indicators of Social competence. Five-point ratings of the adolescent's motivation, use of time, persistence in completing work, ability to work independently, capacity to concentrate and focus attention, as well as the ability to express her/himself verbally and in writing, were employed as indicators of Cognitive competence. Adolescent Emotional well-being was assessed by the teacher's 5-point rating of enthusiasm for learning and 7-point rating of self-esteem (e.g. adolescent satisfaction and realistic confidence in her abilities, reasonable response to both praise and criticism).

Woodcock–Johnson Psycho-Educational Battery-Revised (Time 4: Cognitive). The Woodcock–Johnson Psycho-Educational Battery-Revised (WJ-R; Woodcock & Mather, 1989/1990) is a nationally standardized, individually administered instrument designed to measure the cognitive ability, scholastic aptitudes and achievement of persons between the ages of 24 months and 95 years. For the purposes of this study, we used Woodcock–Johnson Tests of Achievement (WJ-R ACH). Specifically, Passage Comprehension and Calculation subtests scores were used as indicators of adolescent Cognitive competence. Passage Comprehension measures the subject's skill in reading a short passage and identifying a missing word. The task requires the subject to state a word that would be appropriate in the context and taps a variety of comprehension and vocabulary skills. Calculation measures the subject's skill in performing mathematical calculations including combinations of the basic operations, as well as some geometric,

trigonometric, logarithmic and calculus operations using decimals, fractions and whole numbers. Normative data for the WJ-R were gathered from 6359 subjects in over 100 geographically diverse US communities. The distribution of norming data closely approximated the exact distribution in the US population. The internal consistency reliability coefficients for Passage Comprehension and Calculation are .902 and .932, respectively. The content validity, concurrent validity and construct validity of the WJ-R ACH are all adequate (Woodcock & Mather, 1989/1990).

References

- Allison, P. D. (2002). *Missing data (Series: Quantitative applications in the social sciences, no. 136)*. Thousand Oaks, CA: Sage Publications.
- Arend, R. (1984). *Preschoolers' competence in a barrier situation: Patterns of adaptation and their precursors in infancy*. Unpublished doctoral dissertation, University of Minnesota, Minneapolis.
- Banta, T. (1970). Tests of the evaluation of early childhood education: The Cincinnati Autonomy Test Battery (CATB). In J. Hellmuth (Ed.), *Cognitive studies*, Vol. 1. New York: Bruner/Mazel.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist*, 57(2), 111–127.
- Block, J., & Block, J. H. (1973). *Ego development and the provenance of thought: A longitudinal study of ego and cognitive development in young children*. Berkeley: University of California.
- Bontempo, D. E., Hofer, S. M., & Lawrence, F. R. (in press). Assessing factorial invariance in cross-sectional and longitudinal studies. In A. Ong & M. H. M. van Dulmen (Eds.), *Handbook of methods in positive psychology*. New York: Oxford University Press.
- Brooks-Gunn, J., Duncan, G. J., & Maritato, N. (1997). Poor families, poor outcomes: The well-being of children and youth. In G. J. Duncan, & J. Brooks-Gunn (Eds.), *Developmental processes and psychopathology: Vol. 1. Theoretical perspectives and Methodological approaches* (pp. 581–617). New York: Cambridge University Press.
- Carlson, E. A., Sroufe, L. A., & Egeland, B. (2004). The construction of experience: A longitudinal study of representation and behavior. *Child Development*, 75(1), 66–83.
- Chou, C.-P., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 37–55). Thousand Oaks, CA: Sage Publications.
- Cicchetti, D. (1984). The emergence of developmental psychopathology. *Child Development*, 55, 1–7.
- Cicchetti, D., & Cohen, D. J. (Eds.) (1995). *Developmental psychopathology* (Vols. 1 and 2). New York: Wiley.
- Cicchetti, D., & Schneider-Rosen, K. (1986). An organizational approach to childhood depression. In M. Rutter, C. E. Izard, & P. B. Read (Eds.), *Depression in young people: Developmental and clinical perspectives* (pp. 71–134). New York: Guilford Press.
- Cicchetti, D., & Toth, S. L. (Eds.) (1994). *Rochester symposium on developmental psychopathology: Disorders and dysfunctions of the self* (Vol. 5). Rochester, NY: University of Rochester Press.
- Collins, W. A., & Roisman, G. I. (2006). The influence of family and peer relationships in the development of competence during adolescence. In J. Dunn, & A. Clarke-Stewart (Eds.), *Families count: Family effects on child and adolescent development* (pp. 79–103). Cambridge, England: Cambridge University Press.
- Collins, W. A., & van Dulmen, M. H. M. (in press). The significance of middle childhood peer competence for work and relationships in early adulthood. In A. Huston (Ed.), *Successful pathways from middle childhood to adulthood*. Washington, DC: APA.
- Connolly, J., & Doyle, A. (1981). Assessment of social competence in preschoolers: Teachers versus peers. *Developmental Psychology*, 17, 454–462.
- Cumberland-Li, A., Eisenberg, N., & Reiser, M. (2004). Relations of young children's agreeableness and resiliency to effortful control and impulsivity. *Social Development*, 13(2), 193–212.
- Curran, P. J., West, S., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1, 16–23.

- Davis-Kean, P. E., & Sandler, H. M. (2001). A meta-analysis of measures of self-esteem for young children: A framework for future measures. *Child Development*, 72(3), 887–906.
- Dunn, L. M., & Markwardt, F. C. J. (1970). *The Peabody Individual Achievement Test (PIAT)*. Circle Pines, MN: American Guidance Services, Inc.
- Egeland, B. (1997). Mediators of the effects of child maltreatment on developmental adaptation in adolescence. In D. Cicchetti, & S. Toth (Eds.), *Rochester symposium on developmental psychopathology: Vol. VIII. The effects of trauma on the developmental process* (pp. 403–434). Rochester, NY: University of Rochester Press.
- Egeland, B., & Brunnequell, D. (1979). An at-risk approach to the study of child abuse: Some preliminary findings. *Journal of the American Academy of Child Psychiatry*, 18, 219–235.
- Egeland, B., Carlson, E., & Sroufe, L. A. (1993). Resilience as process. *Development and Psychopathology*, 5(4), 517–528.
- Egeland, B., & Kreutzer, T. (1991). A longitudinal study of the effects of maternal stress and protective factors on the development of high risk children. In E. M. Cummings, A. L. Greene, & K. H. Karraker (Eds.), *Life-span developmental psychology: Perspectives on stress and coping* (pp. 61–85). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Egeland, B., Sroufe, L. A., & Erikson, M. (1983). The developmental consequences of different patterns of maltreatment. *Child Abuse and Neglect*, 7, 155–157.
- Eisenberg, N., Smith, C. L., Sadovsky, A., & Spinrad, T. L. (2004). Effortful control: Relations with emotion regulation, adjustment, and socialization in childhood. In R. F. Baumeister, & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 259–282). New York: Guilford Press.
- Furman, W. (1996). The measurement of friendship perceptions: Conceptual and methodological issues. In W. M. Bukowski, A. F. Newcomb, & W. W. Hartup (Eds.), *The company they keep: Friendship in childhood and adolescence*. New York: Cambridge University Press.
- Furman, W., & Bierman, K. L. (1984). Children's conceptions of friendship: A multimethod study of developmental changes. *Developmental Psychology*, 20, 925–933.
- Glantz, M. D., & Johnson, J. L. (Eds.). (1999). *Resilience and development: Positive life adaptations*. New York: Kluwer Academic/Plenum Publishers.
- Grotevant, H. D., & Cooper, C. R. (1981). Assessing adolescent identity in the areas of occupation, religion, politics, friendships, dating, and sex roles: Manual for administration and coding of the interview. *JSAS Catalogue of Selected Documents in Psychology*, 11(52) (Ms. No. 2295).
- Grouzet, F. M. E., Otis, N., & Pelletier, L. G. (2006). Longitudinal cross-gender factorial invariance of the academic motivation scale. *Structural Equation Modeling*, 13(1), 73–98.
- Gutman, L. M., Sameroff, A. J., & Eccles, J. S. (2002). The Academic achievement of African American students during early adolescence: An examination of multiple risk, promotive and protective factors. *American Journal of Community Psychology*, 30(3), 367–399.
- Hanna, E. M. (2002). Children of alcoholics: An examination of stability and level of self-esteem in relation to parental inconsistency. *Dissertation Abstracts International*, 63(3-B), 1562.
- Harrington, D., Block, J. H., & Block, J. (1978). Intolerance of ambiguity in preschool children: Psychometric considerations, behavioral manifestations, and parental correlates. *Developmental Psychology*, 14(3), 242–256.
- Harter, S. (1979). *Perceived competence scale for children: Manual Form O*. Denver, CO: University of Denver Press.
- Harter, S. (1999). *The construction of the self: A developmental perspective*. New York: The Guilford Press.
- Hartup, W. W. (1992). Peer relations in early and middle childhood. In V. B. Van Hasselt, & M. Hersen (Eds.), *Handbook of social development: A lifespan perspective. Perspectives in developmental psychology* (pp. 257–281). New York: Plenum Press.
- Havighurst, R. J. (1952). *Developmental tasks and education*. New York: David McKay Company, Inc.
- Heatherton, T. F., & Wyland, C. L. (2003). Assessing self-esteem. In S. J. Lopez, & C. R. Snyder (Eds.), *Positive psychological assessment: A handbook of models and measures* (pp. 219–233). Washington: American Psychological Association.
- Henderson, V. L., & Dweck, C. S. (1990). Motivation and achievement. In S. S. Feldman, & G. R. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 308–329). Cambridge, MA: Harvard University Press.

- Hetherington, E. M., & Elmore, A. M. (2003). Risk and resilience in children coping with their parents' divorce and remarriage. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 182–212). New York: Cambridge.
- Hiester, M., Carlson, E. A., & Sroufe, L. A. (1993). *The evolution of friendship in preschool, middle childhood, and adolescence: Origins in attachment history*. Paper presented at the biennial meeting of the Society for Research in Child Development, New Orleans, LA.
- Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 158–176). Thousand Oaks, CA: Sage Publications.
- Kenny, D. A. (2003, October). *Measuring model fit*. Retrieved July 24, 2005, from <http://www.davidakenny.net/cm/fit.htm>
- Klaczynski, P. A. (1990). Cultural–developmental tasks and adolescent development: Theoretical and methodological considerations. *Adolescence*, 25, 811–823.
- Larson, R., & Richards, M. H. (1994). *Divergent realities: The emotional lives of mothers, fathers, and adolescents*. New York: Basic Books.
- Linley, P. A., & Joseph, S. (Eds.). (2004). *Positive psychology in practice*. Hoboken, NJ: Wiley.
- Luthar, S. S. (1991). Vulnerability and resilience: A study of high-risk adolescents. *Child Development*, 62, 600–616.
- Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology*, 12, 857–885.
- Luthar, S. S., Doernberger, C. H., & Zigler, E. (1993). Resilience is not a unidimensional construct: Insights from a prospective study of inner-city adolescents. *Development and Psychopathology*, 5, 703–717.
- Luthar, S. S., & Zelazo, L. B. (2003). Research on resilience: An integrative review. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 510–549). New York: Cambridge.
- Luthar, S. S., & Zigler, E. (1991). Vulnerability and competence: A review of research on resilience in childhood. *American Journal of Orthopsychiatry*, 61, 6–22.
- Masten, A. (2001). Ordinary magic: Resilience processes in development. *American Psychologist*, 56, 227–238.
- Masten, A. S., Best, K. M., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology*, 2, 425–444.
- Masten, A. S., Burt, K. B., & Coatsworth, J. D. (2006). Competence and psychopathology in development. In D. Cicchetti, & D. Cohen (Eds.), *Developmental psychopathology, Vol. 3: Risk, disorder, and adaptation* (2nd ed). New York: Wiley.
- Masten, A. S., & Coatsworth, J. D. (1995). Competence, resilience, and psychopathology. In D. Cicchetti, & D. J. Cohen (Eds.), *Developmental psychopathology, Vol. 2: Risk, disorder, and adaptation*. Oxford, England: Wiley.
- Masten, A. S., & Coatsworth, J. D. (1998). The development of competence in favorable and unfavorable environments. *American Psychologist*, 53(2), 205–220.
- Masten, A. S., Coatsworth, J. D., Neemann, J., Gest, S. D., Tellegen, A., & Garmezy, N. (1995). The structure and coherence of competence from childhood through adolescence. *Child Development*, 66, 1635–1659.
- Masten, A. S., & Garmezy, N. (1985). Risk, vulnerability, and protective factors in developmental psychopathology. In B. B. Lahey, & A. E. Kadin (Eds.), *Advances in clinical child psychology*, Vol. 8 (pp. 1–52). New York: Plenum.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., et al. (2005). Developmental cascades: Linking academic achievement, externalizing and internalizing symptoms over 20 years. *Developmental Psychology*, 41(5), 733–746.
- McDonald, R. P., & Ho, M-H.R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods*, 7, 64–82.
- McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, 53(2), 185–204.
- Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika*, 58(4), 525–543.
- Newcomb, A. F., & Bagwell, C. L. (1995). Children's friendship relations: A meta-analytic review. *Psychological Bulletin*, 117, 306–347.
- Nezworski, T. (1983). *Continuity of adaptation into the fourth year: Individual differences in curiosity and exploratory behavior of preschool children*. Unpublished doctoral dissertation, University of Minnesota, Minneapolis.

- Ramirez, M. L., Carlson, E.A., Gest, S., & Egeland, B. (1991). *The relationship between children's behavior at school and internal representations of their relationships as measured by the sentence completion method*. Poster presented at the meeting of the International Society for the Study of Behavioral Development, Minneapolis, MN.
- Roisman, G. I., Masten, A. S., Coatsworth, J. D., & Tellegen, A. (2004). Salient and emerging developmental tasks in the transition to adulthood. *Child Development, 75*, 1–11.
- Rubin, K. H., Bukowski, W., & Parker, J. G. (1998). Peer interactions, relationships, and groups. In W. Damon (Series Ed.) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 619–700). New York: Wiley.
- Rudinger, G., Andres, J., & Rietz, C. (1991). Structural equation models for studying intellectual development. In D. Magnusson, L. R. Bergman, G. Rudinger, & B. Törestad (Eds.), *Problems and methods in longitudinal research: Continuity and change* (pp. 274–307). Cambridge, NY: Cambridge University Press.
- Rutter, M. (1985). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorder. *British Journal of Psychiatry, 147*, 598–611.
- Sameroff, A. (2000). Dialectical processes in developmental psychopathology. In A. Sameroff, M. Lewis, & S. Miller (Eds.), *Handbook of developmental psychopathology* (2nd ed, pp. 23–40). New York, NY: Kluwer Academic/Plenum.
- Sattler, J. M. (1982). *Assessment of children's intelligence and special abilities* (2nd ed). Boston: Allyn and Bacon.
- Seidman, E., & French, S. E. (2004). Developmental trajectories and ecological transitions: A two-step procedure to aid in the choice of prevention and promotion interventions. *Development and Psychopathology, 16*(4), 1141–1159.
- Sesma, A., Mannes, M., & Scales, P. C. (2005). Positive adaptation, resilience, and the developmental asset framework. In S. Goldstein, & R. B. Brooks (Eds.), *Handbook of resilience in children* (pp. 281–296). New York, NY: Kluwer Academic/Plenum.
- Shure, M. B., & Spivack, G. (1974). *Preschool interpersonal problem-solving manual*. Philadelphia, PA: Hahnemann Medical College and Hospitals.
- Skinner, E. A. (1995). *Perceived control, motivation, and coping*. Thousand Oaks, CA: Sage.
- Spivack, G., & Swift, M. (1982). *Devereux elementary school behavior rating scale*. Devon, PA: Devereux Foundation.
- Sroufe, L. A. (1979). The coherence of individual development: Early care, attachment, and subsequent developmental issues. *American Psychologist, 34*(10), 834–841.
- Sroufe, L. A. (1997). Psychopathology as an outcome of development. *Development and Psychopathology, 9*, 251–268.
- Sroufe, L. A., Egeland, B., & Carlson, E. A. (1999). One social world: The integrated development of parent–child and peer relationships. In W. A. Collins, & B. Laursen (Eds.), *The Minnesota Symposia on child psychology: Vol. 30. Relationships as developmental contexts* (pp. 241–262). Hillsdale, NJ: Erlbaum.
- Sroufe, L. A., Egeland, B., Carlson, E. A., & Collins, W. A. (2005). *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood*. New York: Guilford.
- Sroufe, L. A., Egeland, B., & Kreutzer, T. (1990). The fate of early experience following developmental change: Longitudinal approaches to individual adaptation in childhood. *Child Development, 61*, 1363–1373.
- Sroufe, L. A., & Rutter, M. (1984). The domain of developmental psychopathology. *Child Development, 55*, 17–29.
- Steiger, J. H. (2000). Point estimation, hypothesis testing, and interval estimation using the RMSEA: Some comments and a reply to Hayduk and Glaser. *Structural Equation Modeling, 7*(2), 149–162.
- Steinberg, L., & Morris, A. S. (2001). Adolescent development. *Annual Review of Psychology, 52*, 83–110.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed). Boston: Allyn & Bacon.
- Trzesniewski, K. H., Donnellan, M. B., & Robins, R. W. (2003). Stability of self-esteem across the life span. *Journal of Personality & Social Psychology, 84*(1), 205–220.
- Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4–70.
- Waters, E., & Sroufe, L. A. (1983). Social competence as a developmental construct. *Developmental Review, 3*, 79–97.
- Werner, H., & Kaplan, B. (1964). *Symbol formation: An organismic–developmental approach to language and the expression of thought*. New York: Wiley.
- White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*, 297–333.
- Wohlwill, J. F. (1973). *The study of behavioral development*. New York, NY: Academic Press.
- Woodcock, R. W., & Mather, N. (1989/1990). WJ-R tests of achievement: Examiner's manual. In R. W. Woodcock, & M. B. Johnson (Eds.), *Woodcock–Johnson psycho-educational battery-revised*. Allen, TX: DLM Teaching Resources.

- Yates, T. M., Egeland, B., & Sroufe, L. A. (2003). Rethinking resilience: A development process perspective. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 234–256). New York: Cambridge University Press.
- Yates, T. M., & Masten, A. S. (2004). Fostering the future: Resilience theory and the practice of positive psychology. In P. A. Linley, & S. Joseph (Eds.), *Positive psychology in practice* (pp. 521–539). Hoboken, NJ: Wiley.
- Youniss, J., & Smollar, J. (1985). *Adolescent relations with mothers, fathers, and friends*. Chicago: The University of Chicago Press.
- Zimmerman, I., Steiner, V., & Pond, R. (1979). *Preschool language scale*. Columbus, OH: Charles E. Merrill Co.
- Zucker, R. A., Wong, M. W., Puttler, L. I., & Fitzgerald, H. E. (2003). Resilience and vulnerability among sons of alcoholics: Relationship to developmental outcomes between early childhood and adolescence. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 76–103). New York: Cambridge.