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DEFINING ADAPTIVE AND MALADAPTIVE BEHAVIOR WITHIN A MODEL OF PERSONAL COMPETENCE

Kevin S. McGrew and Robert H. Bruininks
Institute on Community Integration,
University of Minnesota

ABSTRACT

Literature on adaptive and maladaptive behavior reveals significant voids in our understanding of these two constructs. Studies using measures of adaptive and maladaptive behavior to correlate with measures of other abilities suggests that the constructs of adaptive and maladaptive behavior are only partially-defined. Much of the existing research has been atheoretical in nature, focusing primarily on measurement issues. To address the limitations in existing research, a study was completed which investigated the relation between adaptive and maladaptive behavior and other important constructs in the context of a model of personal competence. Latent variable structural equation modeling methods were used to evaluate several alternative models of personal competence in three age-differentiated contemporary national samples. The results provided support for a model of personal competence which included the dimensions of physical competence, practical intelligence, conceptual intelligence, and emotional competence. Implications for research and practice are presented.

The construct of adaptive behavior has received increased attention during the past 2 decades due to a number of factors. Major factors include legislation regarding fairness in special education identification and placement procedures, the need to assess and train behaviors that assist in the transition of individuals with disabilities into integrated learning, work or community, and living environments, the need to increase effective parent involvement in educational planning, and the inclusion of adaptive behavior in formal definitions of mental retardation (Bruininks, Thurlow, & Gilman, 1987; Holman & Bruininks, 1985; Keith, Fehrmann, Harrison, & Pottebaum, 1987; Reschly, 1985, 1987; Witt & Martens, 1984).

Although Reschly (1982, 1985, 1987) summarized the common themes that exist across different conceptions of adaptive behavior, a number of issues limit the use of the construct. Foremost is the argument that most adaptive behavior research has been atheoretical in nature (Heath, 1986), and that most conceptions of adaptive behavior only provide a vague idea of the basic construct (Clausen, 1972; Leland, Shellhaas, Nihira, & Foster, 1967; Reschly, 1985). Zigler, Balla, and Hodapp (1984, p. 226), for example, strongly stated that "workers are light years away from agreeing on the ultimate defining feature of social adaptation."

Central to these problems is the fact that no unified notion of adaptive behavior has been established (Greenspan, 1981a; Holman & Bruininks, 1985; Witt & Martens, 1984). The AAMR definition of mental retardation (Grossman, 1983) defines adaptive behavior to include the broad domains of personal independence and social responsibility, and the key concepts of developmental criteria and cultural/environmental influences (Reschly, 1982, 1985, 1987). Specific domains included in the AAMR adaptive behavior definition are sensorimotor skills and development, communication skills, self-help skills, social skills, functional

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Request reprints from Kevin McGrew, 20293 Co. Rd. 45, Clearwater, MN 55320.

academic and cognitive skills, and vocational skills. This broad definition of adaptive behavior has been interpreted to include such seemingly diverse competencies as cognitive functioning, social skills, motor or physical developmental abilities, and maladaptive behavior.

The inclusion of such diverse competencies has produced confusion in how to operationally define and measure adaptive behavior. For example, early conceptions of adaptive behavior were often couched in terms of "social maturity" or "social competence" (Doll, 1934; 1953). To many, the term social competence is synonymous with adaptive behavior. More recently, the term social competence has come to be considered synonymous with such differing conceptualizations as social skills, the combination of social skills and adaptive behavior (Gresham & Reschly, 1987), or the combination of social intelligence and emotional competence (maladaptive behavior) (Greenspan, 1981a). Should social skills or social responsibility be included in the definition of adaptive behavior, or, do these socially related domains represent a dimension which is distinct from adaptive behavior? There appears to be a growing consensus that social responsibility and maladaptive behaviors should be considered as primary components of the adaptive behavior construct. Additional confusion has focused on the inclusion of school-based cognitive skills/competencies (viz., communication, cognitive, and academic skills) in the definition of adaptive behavior. Working from the perspective of developmental task theory, Reschly (1982, 1985, 1987) argued for the inclusion of school-based cognitive competencies in the definition of adaptive behavior. In contrast, Mercer (1973; 1979) argued for a more out-of-school definition of adaptive behavior based on the concern for the overrepresentation of minority children in special education service programs.

Not surprising, this lack of a consensus in definition has resulted in significant differences in the measurement of adaptive behavior. A recent review of the adaptive behavior factor analytic research (McGrew & Bruininks, 1989) found that although five different adaptive behavior scales all appeared to measure a general personal independence ability, the scales differed markedly in their coverage of functional academic/cognitive skills, vocational/community skills, physical/developmental skills, and personal-social skills. Holman and Bruininks (1985) content classification of 13 adaptive behavior scales into 45 areas reinforces the conclusions of McGrew and Bruininks (1989) as the 13 scales varied markedly in their coverage of abilities. Since the measurement of adaptive behavior is increasingly required in state eligibility criteria for mental retardation, the use of different adaptive behavior scales may result in different classification and placement decisions for educational and other service programs.

The varying definitions of adaptive behavior span the continuum from a narrow focus on personal independence and self-help skills to a much broader and all inclusive focus on personal independence, functional academic/cognitive skills, motor or physical/developmental abilities, social skills, and maladaptive behavior. Both researchers and practitioners alike are faced with many problems due to this lack of consensus in defining adaptive behavior. It is our belief that this confusion is due in large part to the absence of an empirically validated comprehensive model of adaptive functioning. Although great strides in understanding adaptive behavior have occurred during the past decade, there is a strong need for research which uses conceptual models to investigate the degree and type of relations between the varying dimensions often included in conceptions of adaptive behavior and social adaptation. There is a clear need to investigate whether the different competencies included under the broadest notions of adaptive behavior can be measured independently, and if so, how they relate to one another. Only after such conceptually based empirical research is completed can we begin to better circumscribe the elusive notion of adaptive behavior.

This article is an initial attempt to present a more comprehensive and theo-

retically-based model of adaptive functioning, one that defines the dimensions of adaptive and maladaptive behavior. As noted in a recent series of articles in *School Psychology Review* (Keith, 1987, 1988a, 1988b), there is a strong need for more research to be based on theory. To fulfill this goal, this article will first present a review of the relevant adaptive/maladaptive behavior literature within the context of a theoretical model of personal competence. This is followed by a model-based research investigation of adaptive and maladaptive behavior which utilizes methods (i.e., structural equation modeling, or what is popularly referred to as the LISREL method) considered particularly useful in research focused on furthering theory development. Although the primary goal is to provide additional insights into the nature of adaptive and maladaptive behavior, a secondary goal is to demonstrate the benefits of conceptualizing and conducting research problems from a more theoretical and model-based perspective.

A Model of Personal Competence

Our position is that it is important to understand how adaptive and maladaptive behavior fit into larger models of personal competence. Such models have considerable practical utility in that they "provide a systematic way of thinking about and understanding the behavior of children and youth. Without a guiding model, any attempt at understanding will be haphazard and may overlook important factors contributing to an individual's behavior" (Greenspan, 1981, p. 31).

A variety of personal competence models have been presented in the literature (Reynolds, 1978; Schaefer, 1975; Zigler & Trickett, 1978); however, few have demonstrated the breadth or depth of Greenspan's (1979, 1981a, 1981b) model of personal competence which includes the broad behavioral realms of *physical competence*, *intellectual competence*, and *emotional competence*. *Physical competence* is not dealt with extensively in the model and includes such variables as strength, size, reaction time, gross and fine motor coordination, static and dynamic balance, speed and precision, visual-motor integration, and flexibility (Bruininks, 1974; Guilford, 1958).

Drawing from communalities in Thorndike's (1920) tripartite model of intelligence and the content plane of Guilford's (1967) three-dimensional structure-of-intellect model, intellectual competence is viewed as having three subcomponents. *Conceptual intelligence* is similar to traditional notions of intelligence and is the "ability to solve abstract intellectual problems and use and understand symbolic processes, including language" (Greenspan, 1981a, p. 30). *Social intelligence* is "a person's ability to understand and to deal effectively with social and interpersonal objects and events" (Greenspan, 1979, p. 483). *Practical intelligence* is analogous to contemporary notions of adaptive behavior as it "represents the ability to deal with the physical and mechanical aspects of life, including both self-maintenance and vocational activities" (Greenspan, 1979, p. 510). The *emotional competence* component represents a variety of character and temperament variables similar in description to the maladaptive dimensions included in many adaptive behavior scales. Finally, Greenspan (1981a) does not consider *social competence* to be a separate component, but rather a combination of elements from social intelligence and emotional competence.

A Model-Based Literature Review

The Relation Between Adaptive Behavior and Maladaptive Behavior

Although the everyday use of the term adaptive behavior generally implies the acquisition of skills needed for successful adaptation (adaptive behavior or practical intelligence) and the absence or reduction of behaviors which interfere with effective adjustment (maladaptive behavior or emotional competence), the research and conceptually oriented literature typically distinguishes between adaptive and maladaptive behavior (Bruininks et al., 1987). However, the degree

and type of relation between these two dimensions has not been clearly delineated.

Using the canonical correlation method, Roszkowski, Spreat, and Waldman (1983) found the redundancy between the adaptive and maladaptive sections of the AAMD Adaptive Behavior Scale (ABS; Nihira, Foster, Shellhaas, & Leland, 1969) to be 30% and 14% when adaptive and maladaptive domains served as the respective criteria. They concluded that the degree of overlap between adaptive and maladaptive behavior was small but statistically significant. These conclusions are supported by a review of typical adaptive/maladaptive correlations presented in Table 1.

Across samples with and without disabilities, the research suggests that adaptive and maladaptive behavior are separate, but weakly to moderately related dimensions (frequently related in an inverse direction). This suggests that valid models of personal competence need to include both dimensions, and need to indicate that they are correlated at low to moderate levels.

Adaptive Behavior and Maladaptive Behavior in Relation to Other Constructs

Intellectual/Academic Abilities. Despite Meyers, Nihira, and Zetin's (1979) discussion of the distinguishing features of adaptive behavior and intelligence, and a large number of studies which have investigated the correlation between measures of these two constructs, there is still limited understanding of the specific relation between adaptive behavior and intelligence (Coulter, 1980; Huberty, 1986; Keith, Fehrmann, Harrison, & Pottebaum, 1987; Reschly, 1982). Meyers et al. (1979) review reported a range of correlations from .09 to .83 between measures of adaptive behavior and intelligence, with an average of approximately .50. Harrison's (1987) review of 42 studies revealed a range from .03 to .91, with the majority being moderate correlations. Despite considerable research, this literature has not been very illuminating since much of the correlational variability appears a function of artifactual sources of variance (e.g., sample characteristics and variability, instrument differences) (Harrison, 1987; Leland et al., 1967; Meyers et al., 1979; Reschly, 1982; Witt & Martens, 1984). In contrast, the adaptive behavior/school achievement correlational research has been limited to a handful of studies (Harrison, 1987; Kamphaus, 1987).

Harrison (1987, p. 39) concluded from her review of the research that "it is difficult to see any major trends across correlations, with the exception of lower correlations for maladaptive sections of scales than adaptive sections." As summarized by Harrison (1987), Roszkowski and Bean (1980) reported average correlations of .22, and Kahn (1983) a range from .03 to .63 between the maladaptive section of the ABS and measures of intelligence. Using the 12 ABS-School Edition maladaptive scales in regular and school classified samples of students with mental retardation, Lambert (1981) reported 48 correlations that ranged from -.23 to .28 ($M\ r$ = -.08). Also using the ABS-School Edition in a school referral sample, Huberty (1987) reported correlations of -.11 and -.02 between one intellectual and two maladaptive factor scores. Working with a sample of institutionalized persons with mental retardation, Aman et al. (1985) reported correlations between intelligence scores and five Aberrant Behavior Checklist maladaptive subscales from -.36 to .19. Finally, using the maladaptive sections of the Vineland Adaptive Behavior Scale (VABS)-Survey Form for samples of institutionalized individuals with mental retardation, Durham (1982) and Kopp, Rice, and Schumacher (1983) both reported low correlations of -.20 and .16, respectively (Harrison, 1987). No research could be located which reported on the relation between maladaptive behavior and academic or school learning.

In contrast to correlational research, Keith and his colleagues (Keith, Fehrmann, Harrison, & Pottebaum, 1987; Keith, Harrison, & Ehly, 1987) have demonstrated the benefits of exploring the relation between adaptive behavior and intelligence/academic abilities with

TABLE 1
Correlations Between Measures of Adaptive and Maladaptive Behavior

Source	Sample	Maladaptive Measures	Adaptive Measures	Correlations
Aman, Singh, Stewart & Field (1985)	Institutionalized Mentally Retarded	Aberrant Behavior Checklist	Vineland Social Maturity Scale	-.41 to .16
		Aberrant Behavior Checklist	AAMD Adaptive Behavior Scale	-.57 to .00
		Aberrant Behavior Checklist	Fairview Self-Help Scale	-.55 to .00
Arndt (1981)	Institutionalized Mentally Retarded	Behavior Development Survey	Behavior Development Survey	-.37 to .28**
Pawlarczyk & Schumacher (1983)	Institutionalized Mentally Retarded	Behavior Development Survey	Behavior Development Survey	.09 to .58
		Behavior Development Survey	Vineland Social Maturity Scale	.07 to .49
		AAMD Adaptive Behavior Scale	Vineland Social Maturity Scale	-.52 to .25
		AAMD Adaptive Behavior Scale	Behavior Development Survey	-.56 to .16
Sparrow, Balla, & Cicchetti (1984)	Mixed Handicaps	Vineland Adaptive Behavior Scale	Vineland Adaptive Behavior Scale	-.60 to .10
	Normal Samples	Vineland Adaptive Behavior Scale	Vineland Adaptive Behavior Scale	-.36 to -.16*
Sidaman, Gibbs, & Geary (1987)	Institutionalized Mentally Retarded	Client Development Evaluation Report	Client Development Evaluation Report	.16 to .33**

Note — Range of correlations indicate that correlations were reported between a number of adaptive and maladaptive scales in each study.

*Median or average correlations from scales standardization age groups.

**Correlations are between adaptive and maladaptive factors obtained through factor analytic procedures. All other correlations are for scale scores.

structural equation methods. Using measures from the Vineland Adaptive Behavior Scale (VABS; Sparrow, Balla, & Cicchetti, 1984) and the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983) as indicators of the latent adaptive behavior and intelligence/achievement constructs, Keith, Fehrmann, Harrison, and Pottebaum (1987) tested three adaptive behavior/intelligence models in a school-age sample and concluded that adaptive behavior and intelligence are separate but related constructs (correlation between latent constructs of .39). Using causal path analysis, Keith, Harrison, and Ehly (1987) explored the relations between adaptive behavior, school achievement, and other variables (viz., intelligence, ethnicity, SES) and concluded that adaptive behavior exerts a significant effect on school achievement.

In sum, recent research suggests that adaptive behavior is separate from, but moderately correlated with measures of intelligence and school achievement. Although investigated less than adaptive behavior, maladaptive behavior typically displays little to no relation with measures of intelligence and school achievement.

These findings suggest that comprehensive models of personal competence need to include all dimensions (i.e., intelligence/academic achievement, adaptive behavior, maladaptive behavior), with the intelligence/achievement and adaptive behavior relation specified as significant and positive, and the intelligence/achievement and maladaptive behavior relation specified to be zero.

Physical/Developmental Abilities. In their reviews of the adaptive behavior factor analytic research, McGrew and Bruininks (1989) and Meyers et al. (1979) found a number of investigations which identified a physical, developmental, or motor factor. Correlations between measures of adaptive behavior and physical/developmental abilities are presented in Table 2. Across measures and samples, most correlations in Table 2 are in the moderate to moderately high range. Only a few investigations have reported correlations between maladaptive behavior and physical/developmental abilities. Sparrow et al. (1984) reported a correlation of -.16 between the respective VABS-Survey Form maladaptive and motor scores in a preschool portion of the standardization sample. Average correlations of .07 and .16 were also reported between two maladaptive factors and one physical/motor factor from the Client Development Evaluation Report (CDER; California State Department of Developmental Services, 1978) in 14 samples of individuals with retardation (Widaman, Gibbs, & Geary, 1987).

To summarize, typically moderate to moderately high correlations have been reported between measures of adaptive behavior and physical/developmental abilities. Very little research has explored the relation between maladaptive behavior and physical/developmental abilities, and that which is available suggests little to no relation. The magnitude of these correlations suggest that within a model of personal competence, physical/developmental abilities and adaptive behavior are highly related. In contrast, maladaptive behavior and physical/developmental abilities appear to be separate and unrelated dimensions.

Social Skills. Social skills are "those behaviors that, within given situations, maximize the probability of securing and maintaining reinforcement and/or decreasing the likelihood of punishment or extinction contingent upon one's social behavior (Gresham & Reschly, 1987, p. 368). Until recently, few researchers had investigated the relation between social skills and other constructs. In a large scale project which investigated the relations between various constructs, Reschly, Gresham, and Graham-Clay (1984) reported low to moderate correlations between measures of adaptive behavior and social skills. Average correlations of .37 and .41 were reported between the Children's Adaptive Behavior Scale (CABS; Richmond & Kicklighter, 1980) and teacher and parent social skills rating scales. Average correlations of .14 and .33 were also reported between another measure of adaptive behavior (viz., the Adaptive Behavior Inventory for Children — ABIC; Mercer, 1979) and two social skills measures. Gresham and Reschly (1987) reported correlations of a similar magnitude in a large mixed sample of regular and special education students.

Widaman et al.'s (1987) factor analysis of the CDER across 14 samples of institutionalized individuals with retardation also provides data on the relation between social skills/intelligence and adaptive/maladaptive behavior. Average correlations of .38 and .41 were reported between two maladaptive factors and a social factor, and .51 between adaptive and social factors. The results of Widaman et al. and Gresham and Reschly's studies suggest that a social skills dimension should be included in a model of personal competence, and that this dimension correlates at a weak to moderate degree with adaptive and maladaptive behavior.

A Model-Based Investigation

The findings and conclusions from reviewing existing research argue for further studies of the relation between the

TABLE 2
Correlations Between Measures of Adaptive Behavior and Physical/Developmental Abilities

Source	Sample	Adaptive Measures	Physical/Dev. Measures	Correlations
Bruininks, Woodcock, Weatherman, & Hill (1985)	Normal Samples	Scales of Independent Behavior	Scales of Independent Behavior	.32 to .63**
	Mixed Handicapped & Nonhandicapped	AAMD Adaptive Behavior Scale	Scales of Independent Behavior	.64 to .76
	Mixed Handicapped & Nonhandicapped	Scales of Independent Behavior	AAMD Adaptive Behavior Scale	.25 to .56
deAvora & White (1987)	Children with Moderate/Severe Disabilities	Minnesota Child Development Scale	Minnesota Child Development Scale	.38 to .73
Goldstein, Smith, Waldrep, & Inderbitzen (1987)	High Risk Infants	Vineland Adaptive Behavior Scale	Vineland Adaptive Behavior Scale	.59 to .64
		Vineland Adaptive Behavior Scale	Bayley Scales of Infant Development	.51 to .60
		Scales of Independent Behavior	Bayley Scales of Infant Development	.55 to .68
		Scales of Independent Behavior	Vineland Adaptive Behavior Scale	.58 to .69
Harrison (1985) & Sparrow, Balla, & Cicchetti (1984)	Normal Samples	Vineland Adaptive Behavior Scale	Vineland Adaptive Behavior Scale	.39 to .55*
Hug, Barclay, Collins, & Lamp (1978)	Head Start Preschool	Preschool Attainment Record	Preschool Attainment Record	.67 to .77
Katz-Garris, Hadley, Garris, & Barnhill (1980)	Institutionalized Mentally Retarded	AAMD Adaptive Behavior Scale	AAMD Adaptive Behavior Scale	.33 to .51
Nihira (1976)	Institutionalized Mentally Retarded	AAMD Adaptive Behavior Scale	AAMD Adaptive Behavior Scale	.06 to .43**
Owens & Bowling (1970)	Institutionalized Mentally Retarded	Preschool Attainment Record	Preschool Attainment Record	.24 to .72
Widaman, Gibbs, & Geary (1987)	Institutionalized Mentally Retarded	Client Development Evaluation Report	Client Development Evaluation Report	.33 to .60**

Note — Range of correlations indicate that correlations were reported between a number of adaptive and physical/developmental scales in each study.

*Median or average correlations from scales standardization age groups.

**Correlations are between adaptive and physical/developmental factors obtained through factor analytic procedures. All other correlations are for scale scores.

constructs of adaptive behavior, maladaptive behavior, social skills, intelligence, and motor skills within a general model of personal competence. Most of the existing literature has generally assessed relations among only two measures of personal competence at-a-time in small and perhaps underrepresentative samples, without the benefit of the multiple perspectives provided by examining relationships among several aspects of personal competence in the same sample, and without the benefit of multivariate statistical procedures. To address this need, this study was designed to provide information on: (a) the validity of Greenspan's model of personal competence including practical intelligence, emotional competence, conceptual intelligence, and physical competence; (b) the correlations among these dimensions; and (c) the plausibility of higher-order personal competence dimensions.

METHOD

Sample

The sample consisted of 422 individuals who participated in the standardization of the *Scales of Independent Behavior* (SIB; Bruininks, Woodcock, Weatherman, & Hill, 1984), a comprehensive, wide-age range measure of adaptive and maladaptive behavior, and who were also administered six subtests of a measure of intelligence (viz., *Woodcock, Johnson Tests of Cognitive Ability*) (WJ; Woodcock & Johnson, 1977) during a special equating study (Bruininks, Woodcock, Weatherman, & Hill, 1985). Random selection procedures were used to select a proportion of each exceptional category (i.e., learning disabled, emotionally disturbed, gifted, mentally retarded) which would approximate the prevalence of each group in the general population. Three samples were formed: *Early Childhood* (24-83 months; *M* CA=62.9 months; *SD*=16.0 months; *n*=100); *Childhood* (84-167 months; *M* CA=127.2 months; *SD*=25.6, *n*=130), *Adolescent/Adult* (168-582 months; *M* CA=329.7 months; *SD*=112.9 months; *n*=192). The sample characteristics are summarized in Table 3.

Instrumentation

The SIB (Bruininks et al., 1984) is a comprehensive measure of adaptive and maladaptive behavior which is usually administered through a structured interview. The SIB was standardized on a sample of 1,764 subjects selected to be representative of the U.S. population (1980 census). Test-retest, internal consistency, and interrater reliabilities are generally in .80's to .90's. Extensive validity studies are reported which indicate that the SIB discriminates well between samples with and without handicaps, correlates in the .70's with scores from other adaptive behavior scales, and correlates highly with age (Bruininks et al., 1985). The cognitive section of the WJ consists of 12 subtests designed to measure the continuum of intellectual functioning (Woodcock & Johnson, 1977). The WJ was standardized on a sample of 4,732 subjects selected to be representative of the U.S. population (1970 census). Subtest and cluster reliabilities generally are in .80's to .90's and validation research has supported the concurrent and criterion-validity of the WJ cognitive tests (McGrew, 1986; Woodcock, 1978). Eleven SIB and WJ measures were used to represent four major components of Greenspan's model of personal competence (1979, 1981a, 1981b), namely, practical intelligence, emotional competence, conceptual intelligence, and physical competence. Unfortunately, Greenspan's social intelligence was not adequately represented in the SIB or WJ and was excluded from this investigation.

Conceptual intelligence was represented by three WJ composite indexes. A *Verbal-Educational* cluster was constructed from an equally weighted combination of two WJ subtests (Picture Vocabulary and Quantitative Concepts) which measure acquired verbal and quantitative knowledge. A *Memory* cluster was constructed from an equally weighted combination of two WJ subtests (Memory for Sentences and Visual-Auditory Learn-

TABLE 3
Characteristics of Three Samples by Gender, Exceptionality, and Race

	Early Childhood (n = 100)	Childhood (n = 130)	Adol./Adult (n = 192)
Gender			
Females	50.0%	49.2%	60.9%
Males	50.0%	50.8%	39.1%
Exceptionality			
Normal	100.0%	89.2%	93.8%
Gifted	0.0%	2.3%	2.1%
Learning disabled	0.0%	3.1%	0.0%
Emotionally disturbed	0.0%	2.3%	1.0%
Mildly retarded	0.0%	2.3%	2.1%
Moderately retarded	0.0%	0.8%	1.0%
Race			
White (85.8%)	83.0%	76.9%	80.2%
Black (12.1%)	16.0%	17.7%	15.6%
Native American (0.6%)	0%	1.5%	1.6%
Asian/Pacific (1.5%)	1.0%	3.8%	2.6%
Hispanic (6.4%)	0%	0%	0%

Note. Values in parentheses are 1980 US Census figures reported by Bruininks et al. (1985).

ing) which requires memory abilities. Finally, a *Perceptual* index was created from an equally weighted combination of two WJ subtests (Spatial Relations and Blending) which tap nonverbal visual-spatial functioning and auditory analysis and synthesis.

Practical intelligence was represented by three SIB clusters. The *Social/Communication* cluster is based on three subscales designed to measure social interaction and the ability to understand and use language. The *Personal Living* cluster includes five subscales that, when combined, measure an individual's effectiveness in meeting everyday demands of personal independence and autonomy. The *Community Living* cluster is based on four subscales that assess an individual's successful adjustment in the community.

The SIB Gross and Fine Motor subscales were used as indicators of the *physical competence* construct. Although these two motor scales are included in the adaptive behavior section of the SIB, research has suggested that these and other motor scales may tap a physical/developmental dimension distinct from other areas of adaptive behavior (Bruininks & McGrew, 1987; McGrew & Bruininks, 1989; Reschly, 1986). Finally, *emotional competence* was represented by the three maladaptive clusters from the SIB Problem Behavior Scale. The *Internalized* cluster is based on three problem behavior areas that assess maladaptive behavior directed towards oneself. The *Externalized* cluster is based on three problem behavior areas that tap inappropriate behavior directed toward others or the environment. Finally, the *Asocial* cluster is based on two SIB problem behavior areas which reflect maladaptive behavior in social contexts.

Scores from the WJ and SIB adaptive/motor measures were in the form of *W* scores, a special transformation of the Rasch ability scales (Bruininks et al., 1985; Woodcock, 1978; Woodcock & Dahl, 1971). The *W* scale is an equal-interval scale centered on a value of 500 which is the approximate average performance of a beginning fifth-grade student. In contrast, the SIB maladaptive clusters are based on a special scale where a zero mean approx-

imates the average level demonstrated at any given age, and where a standard deviation of 10 represents the typical variability observed in an extensive variety of clinical samples (Bruininks et al., 1985). On this scale, large negative scores represent more significant problem behaviors. For each of the three samples an intercorrelation matrix of all SIB/WJ variables served as the primary data source for the analyses. Because of the developmental nature of the SIB and WJ *W* score, the effect of chronological age was statistically removed from all matrices.

Analysis[1]

The latent variable analytic (Bentler, 1980) methods of confirmatory factor and covariance structure analysis, or what is commonly referred to as the LISREL method (Jöreskog & Sörbom, 1984), were used in this investigation. These methods call for investigators to specify in advance the number and composition of the factors (the pattern of subtest loadings on the factors) in their model. Model specification is then followed by the estimation of the model's parameters (factor loadings, variable residuals, correlations between factors) through an iterative maximum-likelihood procedure. The primary statistical objective is to optimally estimate the model's parameters and determine the model's "goodness-of-fit" to the sample data.

Three different "goodness-of-fit" statistics were used in this investigation (Hayduk, 1987; Loehlin, 1987). One index is the root mean square residual (*rmr*) which is the square root of the mean of the squared discrepancies between the observed and implied correlation/covariance matrices. When based on the correlation matrix, relatively small *rmr* values below .10 are considered to reflect a good fit (Cole, 1987). Conversely, the *Goodness-of-fit Index* (GFI) and *Adjusted Goodness-of-fit Index* (AGFI) provide values between zero and one, with 1.0 being a perfect fit. Cole (1987) suggested that the GFI and AGFI are analogous to the multiple and adjusted multiple correlations in regression analyses, with GFIs above .90 and AGFIs above .80 indicative of good fit.

Two models were specified to address the three issues which were the focus of this investigation. The prior review of empirical and theoretical literature supported a *nonhierarchical four-factor* model which contained the separate factors of Physical Competence, Practical Intelligence, Conceptual Intelligence, and Emotional Competence. Since the extant literature suggested that Physical Competence, Practical Intelligence, and Conceptual Intelligence were positively correlated, their latent factor intercorrelations were left free to vary in the model. In contrast, the extant literature suggested that the Emotional Competence/Conceptual Intelligence latent correlation should be fixed at zero (i.e., assumes no significant relation). Finally, the presence of significant positive covariation among measures of Physical Competence, Conceptual Intelligence, and Practical Intelligence suggested that a model with a higher-order factor may be plausible. Thus, a hierarchical model was specified with a second-order *General Development/Competence* factor to account for the covariation among these three first-order factors.

The two models were estimated from each of the three sample correlation matrices with the maximum likelihood fitting function in the LISREL computer program (PC-based Version VI; Jöreskog & Sörbom, 1986). To insure that no solutions were based on local minima, solutions were retained only if they converged to the same parameters from three different start values (.2, .5, .8). Appropriate model identification was determined by inspecting the LISREL program output for indications that the information matrix of parameters was positive definite, a condition which indicates that one can be almost certain that a model is identified (Jöreskog & Sörbom, 1978).

Results

A descriptive summary of the SIB and WJ variables is presented in Table 4. With

TABLE 4
Descriptive Statistics for Latent Factor Indicators by Sample

	Early Childhood		Childhood		Adol./Adult	
	Mean	SD	Mean	SD	Mean	SD
Physical Competence						
SIB Gross Motor	459.7 (445.7)[a]	26.0 (27.2)	499.8 (496.3)	16.9 (18.5)	503.4 (507.1)	15.2 (14.7)
SIB Fine Motor	457.8 (446.3)	24.7 (29.6)	502.8 (499.2)	21.3 (20.2)	528.2 (528.0)	15.2 (12.6)
Practical Intelligence						
SIB Social Comm.	466.1 (455.9)	15.7 (19.2)	504.3 (497.7)	19.5 (18.0)	538.1 (531.8)	17.1 (17.2)
SIB Personal Living	468.0 (458.0)	19.4 (22.0)	501.9 (497.8)	17.9 (17.0)	544.6 (537.1)	16.1 (16.9)
SIB Community Living	446.8 (433.0)	23.6 (26.1)	500.6 (495.9)	20.8 (20.3)	544.2 (539.4)	15.8 (15.7)
Conceptual Intelligence						
WJ Verbal/Educational	442.4 (440.2)	27.0 (23.2)	504.0 (499.6)	25.1 (23.8)	544.3 (536.8)	23.9 (20.2)
WJ Memory	471.5 (471.5)	19.9 (17.9)	502.2 (501.0)	15.5 (13.4)	515.6 (514.2)	16.7 (13.9)
WJ Perceptual	461.1 (464.2)	22.3 (20.0)	497.5 (497.9)	15.7 (13.4)	507.9 (509.7)	17.0 (14.9)
Emotional Competence						
SIB Asocial	-0.9 (-0.8)	9.5 (9.2)	-1.3 (-1.2)	10.3 (10.0)	0.2 (-0.4)	6.8 (6.6)
SIB Internalized	-0.3 (0.2)	8.1 (7.3)	-1.1 (-0.8)	7.9 (7.5)	0.1 (-0.0)	6.7 (6.8)
SIB Externalized	-0.7 (-1.3)	9.7 (10.0)	0.0 (-0.0)	8.5 (8.7)	1.0 (1.0)	5.0 (4.6)

Note. [a]Values in parentheses are means and standard deviations for same age groups in the SIB and WJ national standardization samples.

the exception of higher scores for the physical competence and practical intelligence variables in the Early Childhood sample, the three samples were similar in average level of performance and variability to same-aged nationally representative groups.

Model fit statistics by sample are presented in Table 5. Model path diagrams are presented in Figures 1 and 2 where the observed SIB/WJ measures are represented by rectangles, latent factors by ovals, estimated SIB/WJ factor loadings by single arrow-tipped lines, and estimated latent factor correlations by double arrow-tipped lines. Only the paths among the latent factors are presented in Figure 2 since the hierarchical General Development/Competence model only differed from the nonhierarchical model in how it explained the covariation among three of the first-order factors. In both figures, the three parameter values listed on each path arrow represent the results for the Early Childhood, Childhood, and Adolescent/Adult samples respectively.

TABLE 5
Model Fit Statistics by Sample

Model	Fit Statistics				
	Chi-square	*df*	GFI	AGFI	*rmr*
			Early Childhood		
Nonhierarchical	Improper solution — Heywood case.				
Hierarchical	NA due to nonhierarchical solution.				
			Childhood		
Nonhierarchical	66.9	40	.916	.862	.122
Hierarchical	66.9	40	.916	.862	.122
			Adol./Adult		
Nonhierarchical	99.0	40	.920	.867	.087
Hierarchical	99.0	40	.920	.867	.087

Note. GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, and *rmr* = root mean square residual.

A review of Table 5 found both the hierarchical and nonhierarchical models to be improper in the Early Childhood sample. Inspection of the nonhierarchical solution found that the problem was a Physical Competence/Practical Intelligence latent correlation of 1.01. This Heywood case (Hayduk, 1987; Loehlin, 1987) suggested that the Practical Intelligence and Physical Competence factors, as operationalized in this investigation, were statistically indistinguishable. A subsequent nonhierarchical three-factor model (where all Physical Competence and Practical Intelligence variables loaded on a single factor) was found to produce a good fit (chi-square (df = 42) = 52.1; rmr = .079; GFI = .915; AGFI = .867).

Because of the lack of support for separate Physical Competence and Practical Intelligence factors in the Early Childhood sample, the hierarchical model was only evaluated in the Childhood and Adolescent/Adult samples. In the Childhood and Adolescent/Adult samples the statistics found both the nonhierarchical (Figure 1) and hierarchical General Development/Competence (Figure 2) models to provide equally good fits to the data. In these two samples a higher-order General Development/Competence factor was defined by high parameter values for all three first-order factors (see Figure 2), although the Physical Competence and Practical Intelligence factors were stronger indicators (parameter values in .80s to .90s) than Conceptual Intelligence (parameter values in .60s). With the exception of the Early Childhood Practical Intelligence/Emotional Competence factor correlation, inspection of the parameter/standard error ratios found all model parameters to be positive and significant ($p < .05$).

DISCUSSION

Model-based Conclusions

The results of this investigation demonstrate the value of conceptualizing, designing, analyzing, and interpreting results from a model-based perspective which: (a) starts with a theoretical model; (b) gathers support for the specification of a model based on a review of the literature; and (c) which then empirically confirms the model. The results produced important information about the validity of Greenspan's (1979, 1981a, 1981b) model of personal competence and the relations between adaptive/maladaptive

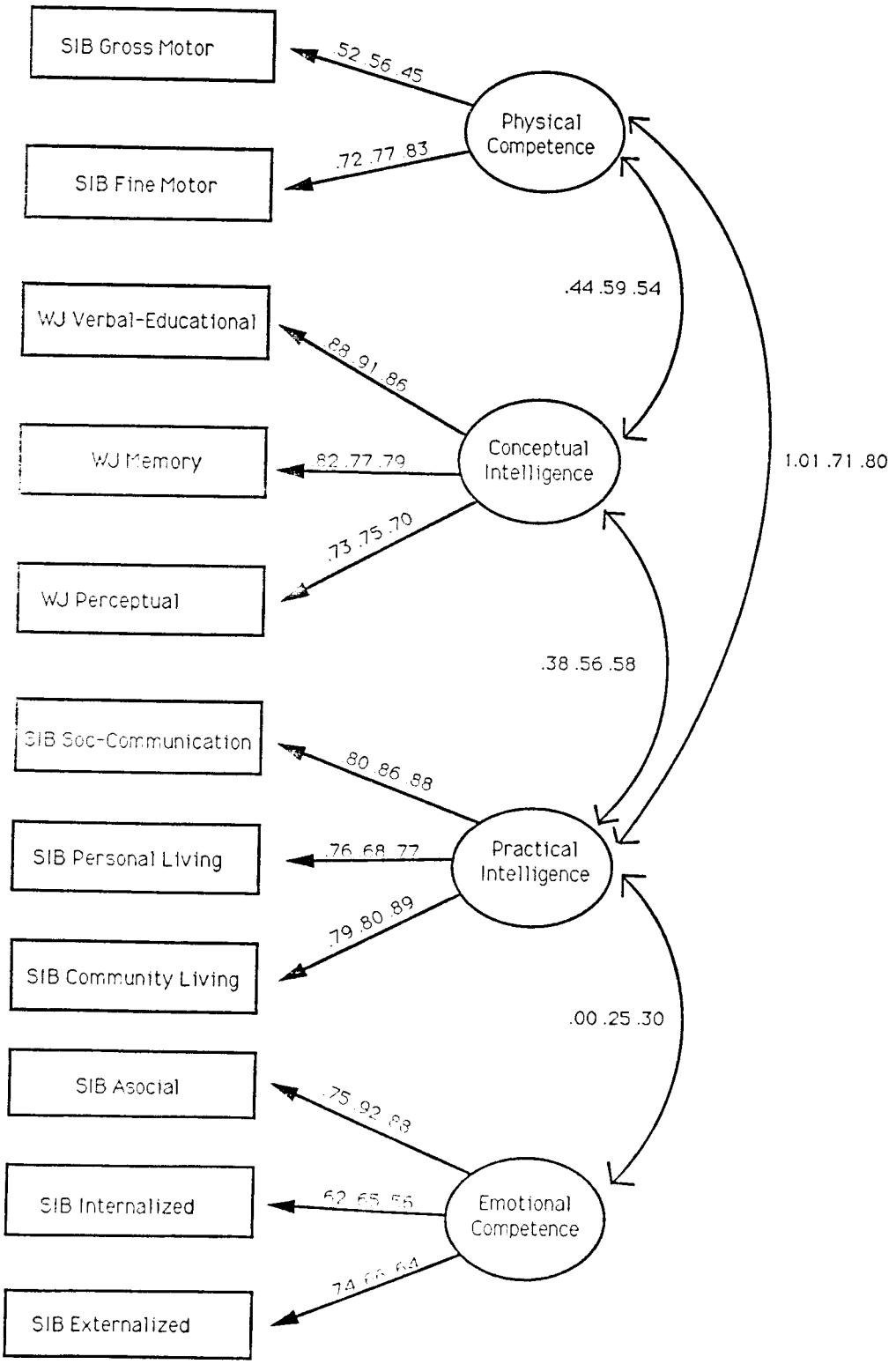

FIGURE 1. Nonhierarchical model solutions.

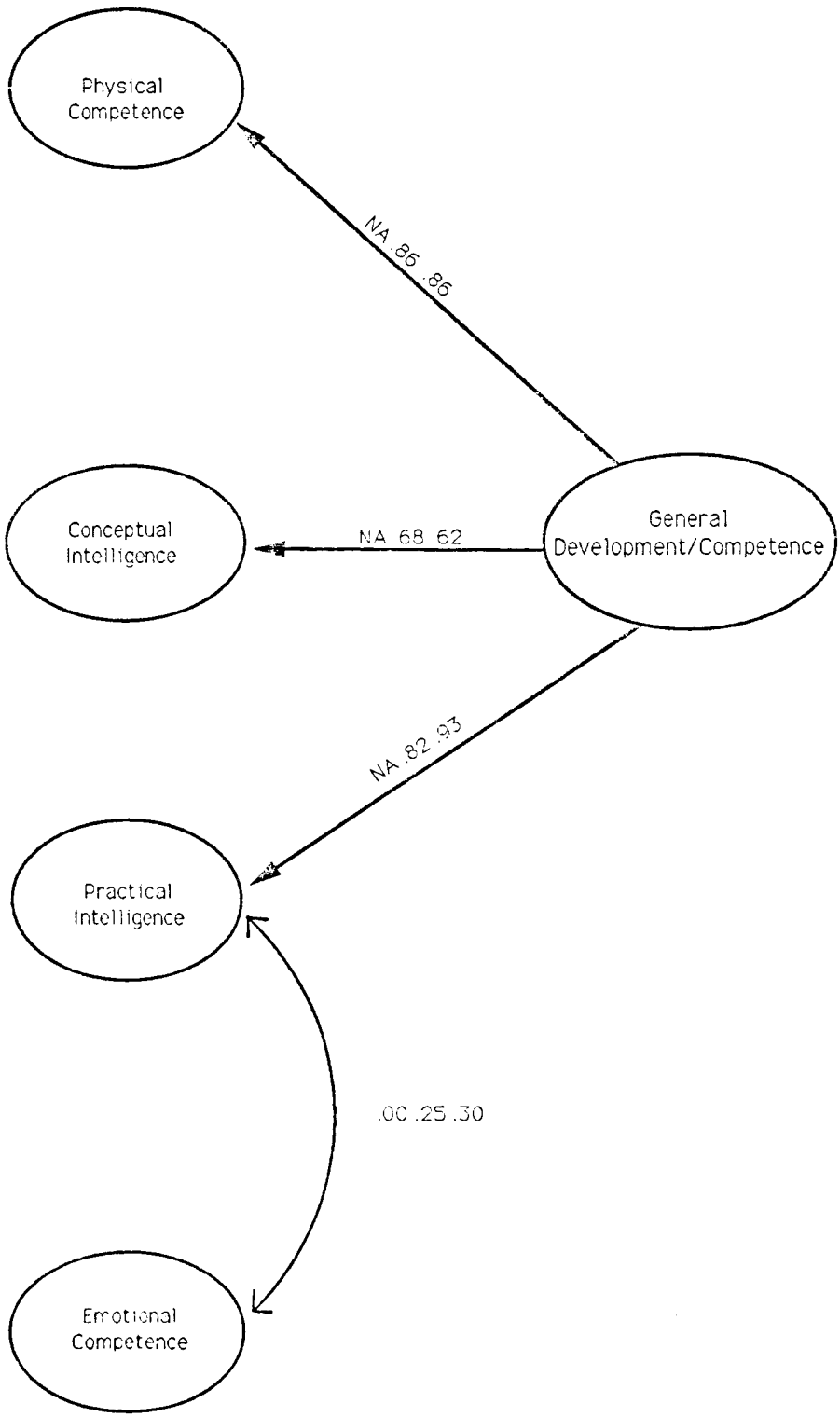

FIGURE 2. Hierarchical model solutions.

behavior and other personal competence constructs.

With the exception of the Early Childhood sample, the results suggested that a model which includes the dimensions of practical intelligence, conceptual intelligence, emotional competence, and physical competence is a plausible framework from which to conceptualize personal competence. Although not included in this investigation, the research of Gresham and Reschly (1987) and Reschly et al. (1984) suggests that a separate social intelligence or skills dimensions also exists which should be included in a model of personal competence. This support for a model of personal competence is consistent with the research of Gresham and Elliott (1987), Reschly, 1987; Reschly et al., (1984), Reynolds (1981), and Widaman et al. (1987). The Early Childhood results suggest that during the early formative years a less differentiated model of personal competence may be necessary, one in which physical competence and practical intelligence overlap substantially. In addition, the results suggest that a model which includes a higher-order General Development/Competence construct which effects an individual's development in the domains of physical competence, conceptual intelligence, and practical intelligence, is a possibility needing additional investigation.

The magnitude of the latent factor correlations found in this investigation were very similar to those suggested by the literature review. Because of the importance attached to adaptive behavior (practical intelligence) and intelligence (conceptual intelligence) in the classification of individuals with mental retardation the latent factor correlations between these two constructs are particularly important. In the nonhierarchical model (Figure 1), the Conceptual Intelligence/Practical Intelligence factor correlations were .38 (Early Childhood), .56 (Childhood), and .58 (Adolescent/Adult). These correlations are similar in magnitude to those suggested by prior research reviews (Harrison, 1987; Meyers et al., 1979), and reinforce the conclusion that Conceptual and Practical Intelligence are separate but related constructs (Keith, Fehrmann, Harrison, & Pottebaum, 1987).

A comparison of these latent factor correlations with the only other reported latent variable study (Keith, Fehrmann, Harrison, & Pottebaum, 1987) finds both similarities and differences. Keith, Fehrmann, Harrison & Pottebaum (1987) reported a correlation of .39 between the latent constructs of adaptive behavior (practical intelligence) and intelligence (conceptual intelligence), as operationalized by measures from the Vineland Adaptive Behavior Scales (VABS) and the Kaufman Assessment Battery for Children (K-ABC). The Early Childhood Practical Intelligence/Conceptual Intelligence correlation of .38 was very similar to the results of Keith and his colleagues, but the correlations of .56 (Childhood) and .58 (Adolescent/Adult) were noticeably higher. Based on additional information supplied by Keith (personal communication, June 23, 1988), it appears that the current Childhood sample is most similar to the sample used by Keith, Fehrmann, Harrison, and Pottebaum (1987). A comparison of the two samples suggested that the higher Practical Intelligence/Conceptual Intelligence factor correlations in this study may partially be due to this investigations sample including a greater proportion of certain exceptionalities (viz., individuals with retardation) which increased the range of scores on the practical intelligence and conceptual intelligence measures. Alternatively, this difference may be a function of the different measures used to operationalize these constructs. The characteristics of samples and measures deserves greater attention in studies that seek to explore dimensions of personal competence (Bruininks & McGrew, 1987; McGrew & Bruininks, 1989). In the absence of additional research, both hypotheses must be considered viable explanations of this difference.

Consistent with the review of previous studies, the latent factor correlations produced by the nonhierarchical model (Figure 1) reinforce the conclusion that the major dimensions of Greenspan's model are separate, although related

personal competencies. Practical intelligence and emotional competence were found to be separate and at best weakly related constructs (correlations in the mid .20s to lower .30s in the Childhood and Adolescent/Adult samples). The correlations between physical competence and conceptual intelligence (mid .40s to .50s in all samples) also indicated that these are separate but related dimensions of personal competence. In contrast, the factor correlation between Physical Competence and Practical Intelligence was consistently higher than all other correlations estimated in this investigation. As previously discussed, the 1.01 correlation suggested that Practical Intelligence and Physical Competence may be indistinguishable in the Early Childhood age range. Although the Practical Intelligence/Physical Competence factor correlations were .71 and .80 in the Childhood and Adolescent/Adult samples, the ± 1 SEM confidence bands around these parameter estimates did not include the value of 1.0. Physical competence and practical intelligence show a strong degree of correlation during the early childhood, childhood and adolescent/adult age ranges.

In contrast to previous research in which many samples have been plagued with a restricted range of abilities (Meyers et al., 1979), the samples used in this investigation included an extensive range of ability. In particular, both the Childhood and Adolescent/Adult samples included normals and individuals with exceptionalities in proportion to their presence in the general population. As a result, the correlations reported for the Childhood and Adolescent/Adult samples are probably good estimates of the population parameters. The lack of individuals with exceptionalities in the Early Childhood sample suggests that the estimates produced in this sample are probably lower bound estimates of the population parameters.

Study Limitations

Although the conclusions reached in this investigation add important information to the adaptive/maladaptive and personal competence literature, a number of limitations in the study partially reduce the generalizability of the findings.

First, the relatively homogeneous Early Childhood sample suggests the need for cross-validation in a more heterogeneous early childhood sample. Second, the SIB Gross and Fine Motor variables are based on the third-party informant method and did not require the subjects to actually demonstrate their physical capabilities. Also, these two motor measures reflect only a small portion of a broad personal competence dimension which includes an array of physical characteristics (Bruininks, 1974; Guilford, 1958). The relatively high Physical Competence/Practical Intelligence factor correlations may be in part a reflection of this instrumentation problem and assessment strategy, and may not accurately reflect the true relation between these two dimensions of personal competence. Third, it would be important to investigate similar models in other samples with other measures (e.g., Revised Stanford-Binet, Wechsler Scales, Kaufman Assessment Battery for Children, Vineland Adaptive Behavior Scale, Comprehensive Tests of Adaptive Behavior). Fourth, the lack of social intelligence or social skills indicators precluded the ability to fully evaluate the complete Greenspan (1979; 1981a, 1981b) and adapted Greenspan (Gresham & Elliott, 1987; Gresham & Reschly, 1987; Reschly, 1987) models. Additional model testing research is needed which includes indicators of this important dimension of personal competence. Finally, it is important to remember that "the data do not confirm a model, they only fail to disconfirm it" (Cliff, 1983, p. 116). Although two plausible models where identified the possibility exists that other models not evaluated in this investigation may provide as good or a possibly better fit to the data.

Additional Research Suggestions

An important next step would be further study and attempts to differentiate the major dimensions of personal

competence. The current study investigated the broadest levels of Greenspan's model of personal competence. Greenspan (1979; 1981a; 1981b) has further delineated the emotional competence dimension to include the subcomponents of temperament and character, which in turn are divided into the areas of reflection, calmness, niceness, and social activity. Greenspan (1979; 1981a; 1981b) has also proposed a detailed social intelligence framework which includes the subcomponents of social sensitivity, social insight, and social communication, which in turn are divided into seven subareas. Drawing on a recent review of the adaptive behavior factor analytic literature (McGrew & Bruininks, 1989), a case could be made for proposing up to four subcomponents of practical intelligence or adaptive behavior (viz., personal independence, social/personal responsibility, functional academic/cognitive, and vocational/community). Substructures could be also proposed in the broad areas of physical competence and conceptual intelligence. Further modeling research which includes at least the next level of Greenspan's model is suggested. Although this would be a very ambitious program of research, models which are developed at this level of specificity would have potentially many more implications for research and practice.

Since it is recognized generally that many individuals with disabilities encounter significant difficulties in vocational and community integration (Bruininks, Thurlow, Lewis, & Larson, 1988), research which links a validated model of personal competence with indicators of community adjustment is recommended. Such research may provide a better understanding of the relative contribution of various personal competencies to successful transition into the community and community adjustment. The linking of a model of personal competence with model-based indicators of community adjustment (Bruininks, McGrew, Thurlow, & Lewis, 1988; McGrew, Bruininks, Thurlow, & Lewis, 1989; Halpern, Nave, Close, & Nelson, 1986) could provide important insights into those personal competencies which should receive high priority during skill training. Such findings could help set appropriate priorities for intervention, research, and policy development.

Implications for Practice

Although much is yet to be learned about the constructs of adaptive and maladaptive behavior (practical intelligence and emotional competence), the current research investigation produces a number of implications for current and future practice.

First, these results have implications for the use and development of current and future assessment instruments. The relatively high correlations between Physical Competence and Practical Intelligence suggest that the interpretation of motor scores from adaptive behavior scales as indicators of a unique ability should be approached cautiously, especially during the early formative years. Although considerable research evidence exists for the uniqueness of physical/developmental abilities, assessment with third-party informant adaptive behavior rating scales may not clearly represent these competencies. If specific assessment of motor skills is needed, the motor sections of adaptive behavior scales may need to be viewed as screening measures to be followed by direct testing of the abilities included under the domain of Physical Competence. If physical competence is a unique dimension distinct from practical intelligence (adaptive behavior), then arguments could be made for not confounding the measurement of both dimensions by the combination of scores into a broad adaptive behavior composite index, at least for youth and adults. Furthermore, if research continues to support the uniqueness of the domains of social intelligence, practical intelligence, and emotional competence, then future assessment instruments should be developed which measure each of these dimensions independently of one another. Although the assessment of adaptive and maladaptive behavior is well differentiated in some current adaptive behavior instruments, most adaptive behavior

scales combine items from the domains of practical intelligence and social skills/intelligence. Perhaps future adaptive behavior scales should focus primarily on those personal independence abilities included under the domain of practical intelligence, and separate measures should be used to measure social skills/intelligence.

Second, the finding that adaptive/maladaptive behavior are unique constructs with minimal redundancy with intelligence and physical abilities indicates that adaptive/maladaptive scales add important information to the more frequently used psychoeducational measures for a variety of important educational and related service issues. Comprehensive assessments which include measures of intelligence, school achievement, physical abilities, social skills/intelligence, and adaptive/maladaptive behavior would provide practitioners with a better understanding of an individual's functioning and special needs. Better classification, placement, and service intervention decisions will likely occur by the addition of measures of adaptive and maladaptive behavior to the more common and traditional measures of intelligence and achievement.

Finally, comprehensive assessments which are interpreted in the context of a model of personal competence may provide for improvements in classification and diagnosis of child psychopathology and special education (Greenspan, 1981a, 1981b). For example, Landesman and Ramey (1989) recently argued for advancing a theoretically based multidimensional diagnostic framework in the field of mental retardation to allow for the systematic description of an individual's development in a number of competencies. A taxonomy based on personal competency, in contrast to a medically based disability taxonomy, may provide a useful starting point for improving the development of noncategorical classification systems and service interventions.

FOOTNOTE

[1]Space limitations precluded a more detailed description and explanation of structural equation methods. Interested readers may wish to review the works of Bentler (1980), Bynner and Romney (1985), Hayduk (1987), Loehlin (1987), Keith (1987, 1988a, 1988b) and Long (1983a, 1983b).

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