

## **Confirmatory Factor Analysis of Early Childhood Ability Measures Within a Model of Personal Competence**

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The present study tested Greenspan's model of personal competence with data obtained from the Early Screening Profiles, a nationally standardized preschool screening battery designed to measure the general functioning level of children 2-7 years of age. Of the five models tested (three a priori and two a posteriori), three models produced results indicative of a good fit. These findings support the use of Greenspan's model of personal competence as a framework for understanding the nature of developing abilities in young children as well as for the improvement of classification and diagnosis of children with special needs.

The Education for All Handicapped Children Act (Public Law 94-142) of 1975 was expanded through the Education of the Handicapped Act Amendments (Public Law 99-457) to include infants, toddlers, and preschoolers (Garwood, Fewell, & Neisworth, 1987). These amendments mandate state and local educational agencies to serve 3- to 5-year-old children who have handicaps or developmental delays. In contrast to Public Law 94-142, service providers are not required to identify a developmental category of delay prior to providing service but may elect to use a noncategorical approach to assessment and intervention with young children (Mallory & Kerns, 1988).

While the benefits of appropriate early educational intervention are well documented (Garwood, 1987; Odom & Karnes, 1988; Reynolds, 1979;

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Woodhead, 1988), many difficult issues remain in the definition, identification, and service of children with special needs. At the heart of these issues is the need for valid and reliable measures of early childhood development, a need that is complicated by factors such as the highly variable nature of early development, limited knowledge of the process of early school adjustment, lack of broad-based and psychometrically valid instruments, and lack of adequate training by personnel who must formally evaluate early childhood abilities (Bracken, 1987; Dillon & Stevenson-Hicks, 1983; Dreiling & Copeland, 1988; Schakel, 1987; Ulrey, 1981). In short, the younger the child, the more difficult the measurement of crucial competencies and skills (Garwood, 1987). One way to offset these limitations is to use a profile of measures rather than a single measure and to gather information from a variety of sources and settings (Gresham, 1983; Paget & Nagel, 1986; Sheehan & Sites, 1988). This multifactored approach can be enhanced by including more than one measure of each ability domain (Gresham, 1983). Such an approach to assessment allows for more appropriate classification and placement of children through a meaningful integration of information from multiple sources (e.g., parent, teacher, pupil) and multiple domains (e.g., cognitive development, adaptive behavior, motor development). Brooks-Gunn and Lewis (1981) have underscored the importance of such a conceptual approach by reporting that it is actually the relationships among skills and across domains that serve as the basis for proactive curriculum planning.

The five areas specifically identified by Public Law 99-457 for preschool evaluations are cognitive development, language development, motor development, socioemotional development, and self-help skills. In the past, assessment professionals have generally had two options when assessing all five areas: combine the best available instruments from each of the respective domains, or elect to use a test that assesses, as nearly as possible, all areas of interest. However, the former results in a battery of tests based on different norm groups and standardization procedures, while the latter may not adequately cover all of the necessary domains. A third and more recently devised alternative would be to use a conformed battery of measures that were designed with Public Law 99-457 in mind.

When considering measures designed to assess the competencies and projected needs of young children, it is helpful to view them not only from a multifactored perspective, but also in the context of a model of personal competence. Keith (1987, 1988a, 1988b) has written extensively about the increased need for assessment-related research to be theory-based and for methods to be appropriate for the evaluation of an instruments-to-theory match (e.g., through confirmatory factor analysis procedures). Although several models of personal competency have been proposed in recent years (Gardner, 1983; Sternberg, 1988), it is perhaps the Greenspan (1979, 1981a, 1981b) model that is most applicable to the developmental needs of young children. Greenspan has advanced a model of personal competence that organizes the

broad range of human abilities into three principal dimensions: Physical Competence, composed of a wide variety of physical/motor abilities; Emotional Competence, composed of a range of socioemotional skills; and Intellectual Competence, which includes the three subareas of Conceptual Intelligence (cognition and language skills), Practical Intelligence (adaptive functioning and self-help skills), and Social Awareness (meeting social and interpersonal demands of everyday life). Recently, McGrew and Bruininks (1990) have found Greenspan's (1979, 1981a, 1981b) model to be a useful framework for linking developmental factors with commonly used psychoeducational measures, a union that is both theoretically based and programmatically useful. Specifically, McGrew and Bruininks (1990) found support for Greenspan's components of Conceptual Intelligence, Practical Intelligence, Emotional Competence, and Physical Competence in early childhood, childhood, and adolescent samples by using covariance structural analysis procedures; however, they were not able to validate the presence of a Social Awareness dimension because of the absence of such measures. High latent variable correlations were identified between the dimensions of Physical Competence and Practical Intelligence, a trend that actually reached unity in the early childhood sample. McGrew and Bruininks (1990) suggested that this finding might have resulted from the limited accuracy of using third-party rating scales as the measure of motor abilities. Further research was recommended to substantiate these findings.

The difficulty that early childhood educators face is identifying a framework that links developmental constructs as specified by Public Law 99-457 with valid measures of early childhood development in a way that is both empirically verifiable and useful in the classroom. Greenspan's model is one such framework. The purposes of this study, then, are (a) to identify reliable ability areas in young children, and (b) to test Greenspan's model of personal competence through confirmatory factor analysis methods with data obtained from a single battery of conormed and nationally standardized measures of preschool development.

## METHOD

### Participants

The subjects in the study were 183 children 4–6 years of age ( $M = 69.5$  months;  $SD = 6.0$  months) from four metropolitan school districts in Minnesota. The sample was evenly divided according to gender (49% female, 51% male); 77% were reported as white, 11% black, 5% Hispanic, and 6% other (1% did not report racial affiliation). Thirty-seven percent of the sample was identified as receiving special services in education, which included Chapter 1, transition kindergarten, speech and language, and special education services. Table 1 provides a more complete breakdown of sample characteristics, includ-

**Table 1**  
**Sample Demographic Characteristics**

| Variable                                    | <i>n</i> | Percentage |
|---------------------------------------------|----------|------------|
| <b>Age</b>                                  |          |            |
| 4-0 to 4-11                                 | 13       | 7.1        |
| 5-0 to 5-11                                 | 100      | 54.6       |
| 6-0 to 6-11                                 | 70       | 3.3        |
| <b>Grade</b>                                |          |            |
| Preschool                                   | 29       | 15.8       |
| Kindergarten                                | 154      | 84.2       |
| <b>Educational status</b>                   |          |            |
| Regular education                           | 113      | 62.2       |
| Receiving special services                  | 68       | 37.2       |
| Not reported                                | 2        | 1.1        |
| <b>Race</b>                                 |          |            |
| Black                                       | 20       | 10.9       |
| Hispanic                                    | 9        | 4.9        |
| White                                       | 142      | 77.6       |
| Other                                       | 10       | 5.5        |
| Not reported                                | 2        | 1.1        |
| <b>Gender</b>                               |          |            |
| Female                                      | 90       | 49.2       |
| Male                                        | 93       | 50.8       |
| <b>Maternal Education</b>                   |          |            |
| Less than high school                       | 13       | 7.1        |
| High school graduate                        | 67       | 36.6       |
| 1-3 years of college or<br>technical school | 55       | 30.1       |
| 4 or more years of college                  | 43       | 23.5       |
| Not reported                                | 5        | 2.7        |

*Note.* *n* = 183.

ing maternal education as the measure of socioeconomic status (SES); its use as an indicator of SES is well documented (Sattler, 1988).

### **Instrument**

The broad instrument used in this study was the Early Screening Profiles (ESP) (Harrison et al., 1990), a new preschool screening battery designed to assess the general level of functioning of children 2-7 years of age. The ESP was selected for the study for three reasons: (a) its scope in assessing the five areas specified by Public Law 99-457, (b) the similarities between the ESP scales and the domains specified in Greenspan's model of personal competence, and (c) the psychometric integrity of the ESP scales. A one-to-one correspondence between Greenspan's principle domains and the five areas specified by PL 99-457 is not readily apparent. However, Greenspan's principle domains and the ESP's three major profiles are closely aligned. The ESP profiles include the five developmental areas required by Public Law 99-457 and constitute a useful package for examining the broad-reaching but highly

interrelated abilities of young children. The ESP was developed from three well-established measures of cognitive functioning, adaptive behavior, and motor performance: the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983), the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984a, 1984b, 1985), and the Bruininks–Oseretsky Test of Motor Proficiency (Bruininks, 1978), respectively. In developing the ESP, items from these instruments were adapted to be more appropriate for preschoolers and new items were created specifically as measures of early childhood abilities. The ESP was normed on 1,022 preschool children drawn from a nationally representative standardization sample stratified according to age, race, gender, SES, and geographic region and based on 1990 estimates extrapolated from 1980 U.S. Census Bureau data (Harrison, 1990).

Predictive correlations between the ESP and other measures of achievement and aptitude were reported by Harrison (1990) to be moderate to high (e.g., Cohn, 1990; Duncan, 1989). Concurrent correlations with other screening and diagnostic measures have also been reported to be moderate to high (Duncan, 1989; LaQua, 1989a, 1989b; Spiegel, Steffens, Rynders, & Bruininks, 1990). In a multivariate analysis of differences according to race, gender, and maternal education, Ittenbach and Harrison (1990) found that the ESP revealed trends similar to those of other measures of cognitive functioning, adaptive behavior, and motor development. See Table 2 for a description of the scales, subscales, and survey/rating forms used in this study.

## Procedures

Data were collected in January and February 1988 as part of an earlier longitudinal study (LaQua, 1989b). Administrators from four Minnesota school districts agreed to participate in this study; information and permission forms were sent to parents of all students in targeted classrooms. After parent permission was received, the ESP was administered to the children individually by trained examiners; total administration time was 30–45 minutes per child. Parent surveys were completed by the parents with interviewer assistance when necessary.

## Data Analysis

Analysis of covariance structures, generally referred to as the LISREL method (Long, 1983a, 1983b), was used as the primary method of data analysis in this study. This method is well suited for evaluating relationships among measures, particularly when those measures are organized within a broader theoretical framework: It allows researchers to specify (a) the measures that compose each latent factor, (b) the correlations among the latent factors, (c) the number of latent factors within a collection of measures, and (d) the correlations among residuals. The procedures used to develop and evaluate the models specified in

**Table 2**  
**Description of the Early Screening Profile Scales**

| Scales                                          | Abilities                                                                                                         |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Cognitive/Language Profile (Tests)</b>       |                                                                                                                   |
| Verbal Concepts                                 | Receptive and expressive language skills in naming and identifying objects by characteristics.                    |
| Visual Discrimination                           | Identification of pictures that are identical to other pictures.                                                  |
| Logical Relations                               | Selection of pictures that either complete a simple analogy or belong to the same taxonomy as other pictures.     |
| Basic School Skills                             | Recognition of concepts such as quantity, size, and shape; identification of written numbers, letters, and words. |
| <b>Self-Help/Social Profile (Rating Scales)</b> |                                                                                                                   |
| Communication                                   | Receptive and expressive language skills pertaining to personal experiences.                                      |
| Daily Living                                    | Appropriate eating and self-care skills.                                                                          |
| Socialization                                   | Social skills required in conversing, playing games, following rules, and making friends.                         |
| Motor Skills                                    | Movement coordination skills such as walking, climbing, hopping, and using a writing utensil.                     |
| <b>Motor Profile (Tests)</b>                    |                                                                                                                   |
| Gross Motor                                     | Performance of tasks such as standing and walking on a line and catching a ball.                                  |
| Fine Motor                                      | Performance of tasks such as stringing beads and copying shapes with a pencil.                                    |

this study followed the specification, estimation, evaluation, and readjustment (SEER) model outlined by Horn and McArdle (1980). Maximum likelihood parameter estimates were obtained by using the ML (Maximum Likelihood) estimation option fitting function of the LISREL-VII program (Jöreskog & Sörbom, 1989). A correlation matrix of ESP residualized raw scores from the measures served as the source of input for the LISREL program.<sup>1</sup> The correlation matrix is presented in Table 3. Hayduk (1987) and Loehlin (1987) have identified several different indices that are useful in determining how well the matrix of observed correlations compares with the matrix of a specified model. The indices used in this study were as follows:  $\chi^2$ , goodness-of-fit index (*GFI*), adjusted goodness-of-fit index (*AGFI*), and root-mean-square residual (*rmr*). *GFI*s equal to or greater than .90, *AGFI* values equal to or greater than

<sup>1</sup>Residualized scores were calculated with a first-degree model that removed the linear effects of age. A second-degree model was not deemed necessary, since all variables had less than 3% variance accounted for by the age<sup>2</sup> term.

**Table 3**  
**Correlation Matrix**

|     | VC  | VD  | LR  | BS  | COM | DL  | SOC | MOT | GM  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| VD  | .38 |     |     |     |     |     |     |     |     |
| LR  | .41 | .30 |     |     |     |     |     |     |     |
| BS  | .48 | .56 | .37 |     |     |     |     |     |     |
| COM | .42 | .41 | .26 | .48 |     |     |     |     |     |
| DL  | .06 | .06 | .09 | .05 | .40 |     |     |     |     |
| SOC | .21 | .21 | .20 | .16 | .54 | .57 |     |     |     |
| MOT | .32 | .29 | .18 | .22 | .46 | .44 | .52 |     |     |
| GM  | .32 | .38 | .31 | .32 | .28 | .08 | .17 | .38 |     |
| FM  | .37 | .48 | .22 | .43 | .34 | .06 | .18 | .34 | .50 |

*Note.* VC, Verbal Concepts; VD, Visual Discrimination; LR, Logical Relations; BS, Basic School Skills; COM, Communication; DL, Daily Living; SOC, Socialization; MOT, Motor Skills; GM, Gross Motor; FM, Fine Motor.

.80, and *rmr* values less than .10 have been identified by Cole (1987) as indicative of a good fit.

## RESULTS

### A Priori Models

Based on prior theory (*viz.*, Greenspan's model of personal competence), a review of past research (McGrew & Bruininks, 1990), and task analysis of the ESP scales, three a priori models were hypothesized. All contained three first-order latent factors for the areas of Conceptual Intelligence, Practical Intelligence, and Physical Competence.

**Model 1.** An important feature of this model, in light of the McGrew and Bruininks (1990) research and as presented in Model 1, was the loading of the Motor Skills scale (a third-party rating of motor abilities) on both the Practical Intelligence and Physical Competence factors. This dual loading assists in determining what third-party rating scales of motor abilities are actually measuring. Model 1 (Figure 1) was determined to be a plausible framework for explaining the correlational variance among the ESP scales,  $\chi^2_{(30)} = 39.09$ ,  $p = .12$  ( $GFI = .96$ ;  $AGFI = .93$ ;  $rmr = .04$ ).

**Model 2.** To facilitate an evaluation of the Motor Skills scale as a measure of Motor Abilities as opposed to Practical Intelligence, the Motor Skills scale was specified as a measure of Physical Competence only, instead of a measure of both Physical Competence and Practical Intelligence as specified in Figure 1 (see Figure 2),  $\chi^2_{(31)} = 87.75$ ,  $p < .01$  ( $GFI = .91$ ;  $AGFI = .89$ ;  $rmr = .07$ ).

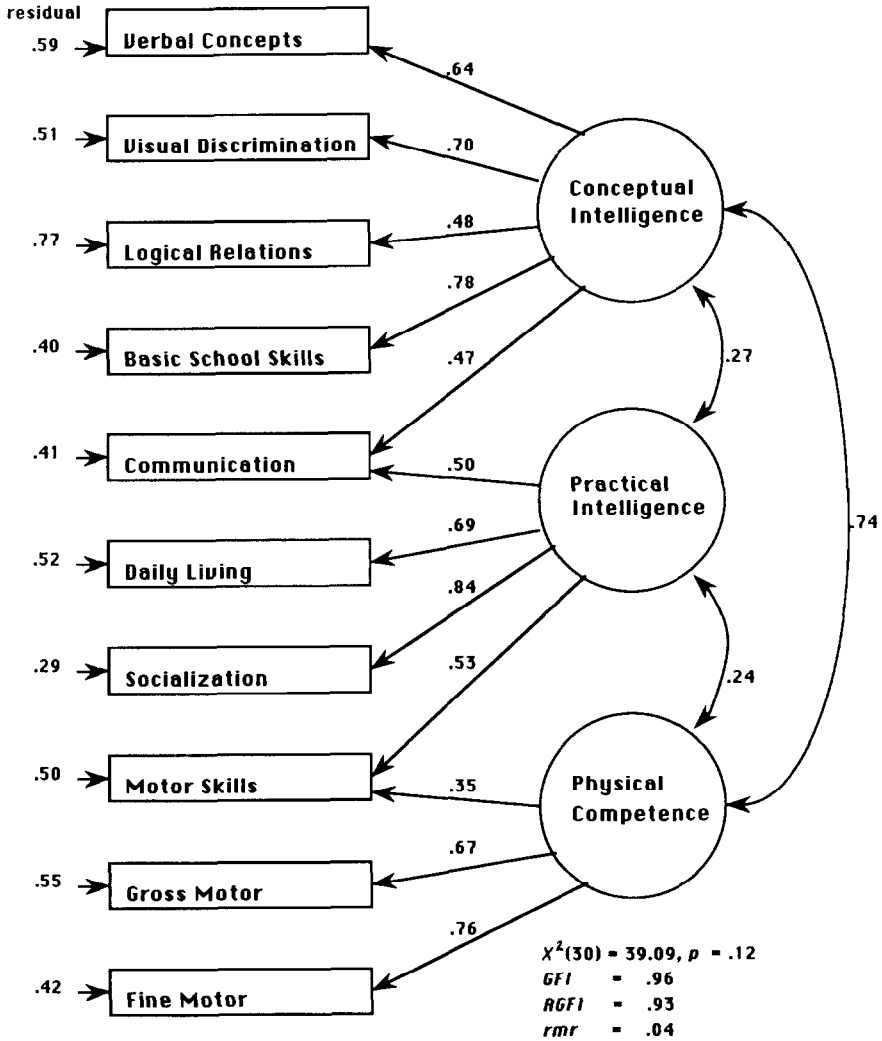


Figure 1. A priori Model 1, containing three latent factors.

### Model 3

To evaluate further the contribution of the Motor Skills scale to the model as a whole, Model 3 differed from Model 2 in only one respect, the specification that the Motor Skills scale was a measure of Practical Intelligence only (see Figure 3). This analysis produced a  $\chi^2_{(31)} = 61.59, p = .01$  ( $GFI = .94$ ;  $AGFI = .85$ ;  $r_{mr} = .07$ ).



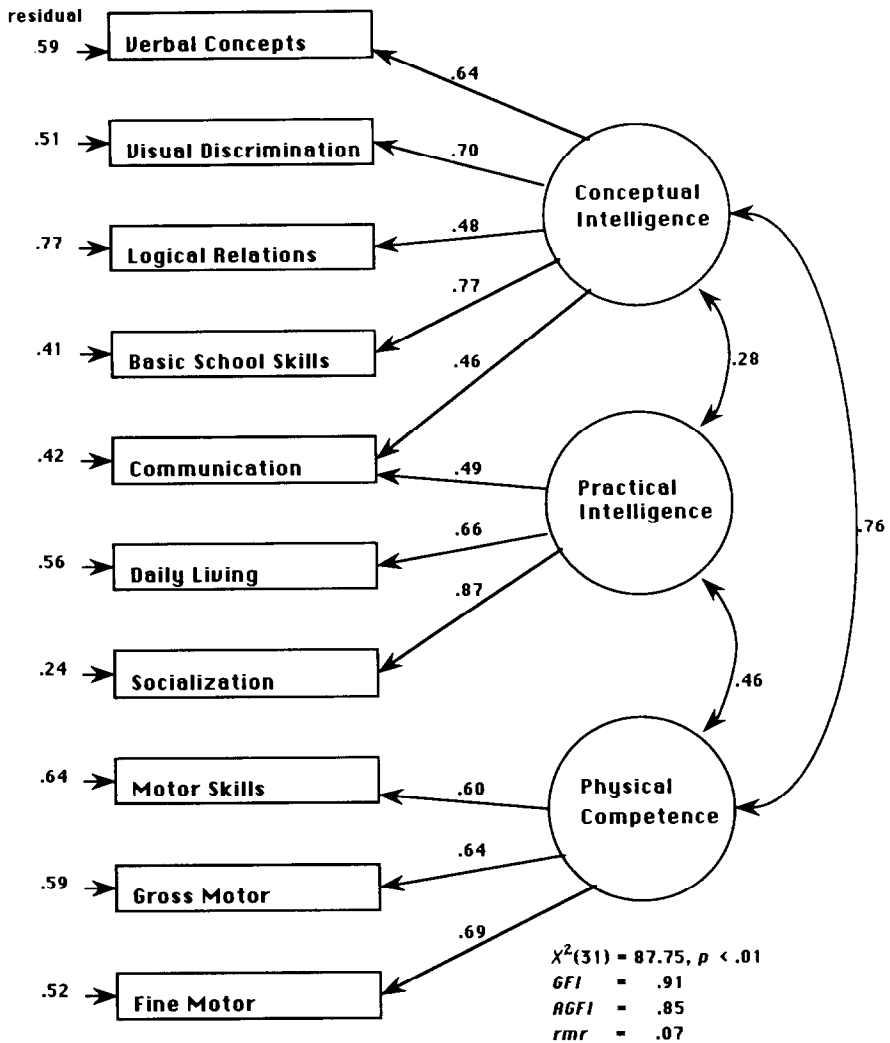


Figure 2. A priori Model 2, containing three latent factors.

### A Posteriori Models

Two subsequent analyses were conducted that were based on information obtained in the preceding analyses. LISREL modification indices (Jöreskog & Sörbom, 1989) that estimate the anticipated changes in  $\chi^2$  as a result of changes to the models themselves (e.g., adding or deleting parameters) were used as the basis for the modifications.

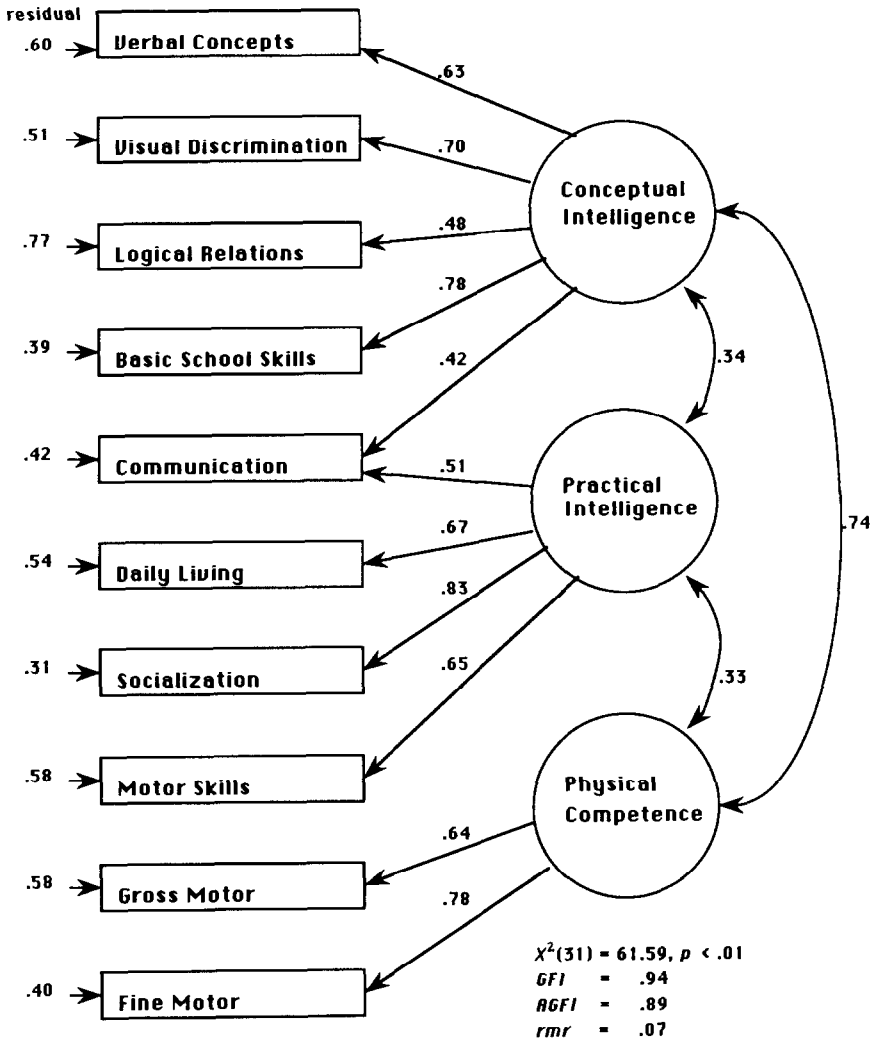


Figure 3. A priori Model 3, containing three latent factors.

**Model 1.** On the basis of prior research (McGrew & Bruininks, 1990) and the observed intercorrelations of the Conceptual Intelligence, Practical Intelligence, and Physical Competence factors (see Figures 1–3), it was hypothesized that a single higher-order factor (General Competence) might explain the covariation between first-order factors presented in Model 1 (Figure 1). While the parameters for the first-order constructs remained unchanged from Figure 1, the loadings for the first-order factors on the second-order General Competence factor were as follows: Conceptual Intelligence (.90), Practical Intelli-

gence (.30), Physical Competence (.81). Since this model is mathematically equivalent to the model presented in Figure 1, the fit statistics were identical to those reported for Model 1 (see Table 3).

**Model 2.** The LISREL modification indices from the a priori models suggested that three additional parameters should be considered: (a) Visual Discrimination on Physical Competence in addition to its loading on Conceptual Intelligence; (b) Socialization on Conceptual Intelligence in addition to its loading on Practical Intelligence; and (c) Fine Motor on Conceptual Intelligence in addition to its loading on Physical Competence. Consequently, a posteriori Model 2 was hypothesized with (a) and (c), but not (b). Closer examination of items on these scales tended to support this new model, given the visual-perceptual nature of the Visual Discrimination scale (often a requisite for effective motor functioning) and the fact that the Fine Motor scale contained Mazes, which have historically been used as measures of intellectual ability (Kaufman, 1979). The placement of the Socialization scale on Conceptual Intelligence appeared to be less defensible and therefore was not specified. The resulting fit statistics for this model were as follows:  $\chi^2_{(28)} = 31.76$ ,  $p = .28$  ( $GFI = .97$ ;  $AGFI = .93$ ;  $rmr = .04$ ). The factor loading parameters for this model were very similar to those reported for a priori Model 1 (Figure 1). Of the two new parameters, the Visual Discrimination loading on Physical Competence (.22) was statistically significant ( $t = 2.16$ ,  $p < .05$ ), while the Fine Motor loading on Conceptual Intelligence (.23) was not ( $t = 1.85$ ,  $p > .05$ ). The Conceptual Intelligence/Practical Intelligence correlation (.26) and the Practical Intelligence/Physical Competence correlation (.23) were very similar to those reported in Figure 1. However, the Conceptual Intelligence/Physical Competence correlation (.58) was much smaller than its analogous correlation (.74) in Figure 1.

### Evaluation of Models

The fit statistics for all the models are summarized in Table 4. Comparative tests using procedures outlined by Loehlin (1987) suggest that a priori Model 1 provides a significantly better fit than either a priori Model 2 ( $\chi^2_{(1)} = 48.66$ ,

**Table 4**  
Summary of Fit Statistics

| Model               | <i>df</i> | $\chi^2$ | <i>p</i> | <i>GFI</i> | <i>AGFI</i> | <i>rmr</i> |
|---------------------|-----------|----------|----------|------------|-------------|------------|
| A priori models     |           |          |          |            |             |            |
| 1                   | 30        | 39.09    | .12      | .96        | .93         | .04        |
| 2                   | 31        | 87.75    | .00      | .91        | .85         | .07        |
| 3                   | 31        | 61.59    | .00      | .94        | .89         | .07        |
| A posteriori models |           |          |          |            |             |            |
| 1                   | 30        | 39.09    | .12      | .96        | .93         | .04        |
| 2                   | 28        | 31.76    | .28      | .97        | .93         | .04        |

$p < .01$ ) or Model 3 ( $\chi^2_{(1)} = 22.50, p < .01$ ). A comparative analysis between a posteriori Model 1 and the other models was not possible because of the nonnested nature of the designs.

Although the second a posteriori model (Model 2) fit indices were essentially similar to those from other models, its major limitation was that it was specified *following* a review of results from a priori analyses. Furthermore, one of the two new parameters, Fine Motor on Conceptual Intelligence, was not found to be statistically significant. Although this model demonstrates a good fit statistically, acceptance of this model (with the possible deletion of the Fine Motor–Conceptual Intelligence parameter) would require cross-validation with additional samples. The value of this model lies in the identification of a possibly overlooked characteristic of the ESP's Visual Discrimination scale, and the observation that otherwise high Conceptual Intelligence/Physical Competence correlations ( $Mdn = .74$ ) for other models may actually be lower (.58) when the Conceptual Intelligence and Physical Competence constructs are defined slightly differently.

## DISCUSSION

The results of this study provide important information about relationships among early childhood abilities when examined within a model of personal competence. Although a priori Model 1 demonstrated relatively better fit than the others, the strong fit of all a priori and a posteriori models with three first-order factors supports the validity of the investigated portion of Greenspan's model of personal competence. Social Awareness and Emotional Competence dimensions were not evaluated because of a lack of sufficient measures. When combined with the results of McGrew and Bruininks (1990), these findings suggest that Conceptual Intelligence, Practical Intelligence, and Physical Competence are separate dimensions of personal competence. In the McGrew and Bruininks (1990) study, because of a latent factor correlation of 1.00 in their early childhood sample, a question was raised whether Physical Competence and Practical Intelligence were distinct dimensions. They suggested that their difficulty in finding evidence for a separate Physical Competence dimension may have been due to a reliance on third-party rating scales of motor abilities rather than on actual performance measures. The current study used a combination of rating scales and tests to define the Physical Competence factor. Across all models, the Practical Intelligence/Physical Competence correlation was less than .46, a value well below those of .71 (childhood), .80 (adolescent/adult) and 1.00 (early childhood) reported by McGrew and Bruininks (1990). This important finding suggests that their assumption may have been correct in that evidence for the distinct dimensions of intellectual, practical, and motor competence was likely obscured when measures of physical competence were based only upon third-party ratings rather than on measures that also included actual indices of physical performance. When combined with a review of prior correlational and modeling research, these studies

provide support for the inclusion of separate components of physical proficiency, conceptual skills, practical life skills, and emotional behavior as constituents of overall personal competence in young children. Although correlational research suggests that a separate Social Awareness dimension also exists (McGrew & Bruininks, 1990), no modeling study, including this one, has yet included satisfactory measures of this dimension to allow for a formal evaluation of its relation to other dimensions of personal competence.

The low magnitude of two of the three latent factor correlations found in Model 1 (Figure 1) and a posteriori Model 2 did not strongly support a higher-order General Competence construct. Therefore, the results showed substantive similarities to and differences from other modeling studies. Because of the importance attached to both intelligence and adaptive behavior in the definition and classification of persons with mental retardation, the correlations between Conceptual Intelligence and Practical Intelligence are most important. In a priori Model 1 (Figure 1) the correlation value of .27 is somewhat lower than the .39 value reported by Keith, Fehrman, Harrison, and Pottebaum (1987) in a somewhat older sample and the .38 value reported by McGrew and Bruininks (1990) in their early childhood sample. These differences most likely reflect differences in characteristics across samples and across measures (McGrew & Bruininks, 1990). The magnitude of these correlations continues to reinforce the conclusions, reached by Harrison (1987) and Meyers, Nihira, and Zetlin (1979) in reviews of the literature, and Keith et al. (1987) and McGrew and Bruininks (1990) in modeling research studies, that intelligence (Conceptual Intelligence) and adaptive behavior (Practical Intelligence) are separate but related dimensions of personal competence.

As previously discussed, the low Practical Intelligence/Physical Competence correlations (.24) found in this study provide strong evidence in support of the distinctiveness of these two dimensions of personal competence. The high .74 Conceptual Intelligence/Physical Competence correlation (see Figure 1) was unexpected and differs from the more moderate correlations (.44-.59) reported by McGrew and Bruininks (1990). The differences in these correlations most likely relate to differences in the measures used to define Physical Competence in these separate investigations. In the McGrew and Bruininks (1990) study, Physical Competence was defined by third-party ratings of fine and gross motor skills. In the current study, two of the three measures that defined Physical Competence were actual tests of fine and gross motor skills. Furthermore, the Fine Motor test had the strongest factor loading (.76) on this factor. Inspection of the items in the Fine Motor test reveals that it contains items that require the child to copy geometric designs and complete mazes, tasks that have been included in and correlated with measures of intelligence (Koppitz, 1975). Thus, the measures used to define Physical Competence in this study may share considerable variance with intelligence, a relationship that may result both from the related development of fine motor skills and intellectual skills and from the less differentiated nature of abilities in younger children.

These findings support a model of personal competence, particularly when

students with special needs are under consideration. This sample included a substantial number of children identified as handicapped or at risk for developmental delay, and the results of this study reinforce the conclusion that comprehensive assessments that include measures of these distinct dimensions may provide for a more comprehensive and integrated understanding of an individual's level of functioning (Greenspan, 1981a, 1981b) and for improvement of classification and diagnosis of children with special needs (McGrew & Bruininks, 1990). By assessing levels of functioning among skills and across domains, a more comprehensive and useful profile of a child's functioning emerges (Brooks-Gunn & Lewis, 1981). Development and investigation of additional models of personal competence may assist with this task—a task that may well lead to the development of more appropriate and individualized interventions as well as broad-based sets of curriculum and program plans.

There are a number of limitations to this study. First, the participants were not randomly selected; therefore, the results of this study cannot be used to generalize to other settings without reservation. While the largest percentage of children was drawn from regular education kindergarten classrooms, a substantial number of children were identified as pupils receiving special services, which altered the constitution of the sample in unknown ways. Second, all data were obtained by means of a 45-minute instrument rather than an extensive or diagnostic measure. Screeners, by their very nature, have lower indices of reliability and validity, phenomena that directly affect the measurement process (Ittenbach, Harrison & Deck, 1989). Third, confirmatory modeling procedures can only identify plausible models. Other models not evaluated in this study may prove to be equally if not more plausible than the models presented in this investigation. Finally, the lack of multiple measures of Social Awareness precluded a fair estimate of this construct's correlations with other factors and measures, the model proposed by Greenspan (1979, 1981a, 1981b), and the model evaluated by McGrew and Bruininks (1990) in prior research.

Additional research is needed on early childhood measures of abilities within a model of personal competence. First, a major research priority is the completion of studies that include indicators of all key components of a model of personal competence. More comprehensive measurement of social awareness and socioemotional skills is required to adequately represent these dimensions. Second, the construct of physical competence may be much broader than gross and fine motor abilities as assessed in this study (Bruininks, 1974; Greenspan, 1979, 1981a, 1981b). Although the inclusion of direct tests of motor functioning in this study provided better operationalization of this dimension than reported earlier (McGrew & Bruininks, 1990), further investigations with additional measures are needed. Third, new modeling research that includes longitudinal effects and cross-sectional differences is recommended to evaluate the developmental invariance of these models across different age groups. The present study assessed abilities within the age range of 4–6

years. The components of ability in younger children is still in need of further exploration. Finally, cross-validation across samples of individuals with and without disabilities and those in different cultural groups is needed to evaluate more completely the generality of these and other models of personal competence.

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