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ABSTRACT

The Stanford-Binet (Fourth Edition) (S-B:FE) and Kaufman Assessment Battery for Children (K-ABC) were administered in counterbalanced order to a sample of 30 non-handicapped, preschool children (13 males and 17 females). The children ranged in age from 3 years 11 months to 6 years 2 months, with a mean age of 4 years 11 months. Mean scores on the global scales of both tests, the factor scores of the S-B:FE (as proposed by J. Sattler) and the supplementary scales of the K-ABC (as proposed by R. Kamphaus and C. Reynolds) were in the average range. Correlations (corrected for restriction in range) between the instruments were strong with the test composite/mental processing composite correlation at 0.57. Global scales measuring verbal reasoning/comprehension, memory, and achievement correlated significantly with each other. Less consistency was present for global scales measuring non-verbal reasoning. Four data tables are included. (Author/TJH)

Intelligence Measures in a Preschool Sample: S-B:FE and K-ABC Relationships

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Running head: S-B:FE/K-ABC

Abstract

The Stanford-Binet: Fourth Edition (S-B:FE) and Kaufman Assessment Battery for Children (K-ABC) were administered in counterbalanced order to a sample of 30 nonhandicapped, preschool children (13 males and 17 females). Mean scores on the global scales of both tests, the factor scores of the S-B:FE (as proposed by Sattler) and the supplementary scales of the K-ABC (as proposed by Kamphaus and Reynolds) were in the average range. Correlations (corrected for restriction in range) between the instruments were strong with the Test Composite/Mental Processing Composite correlation at .57. Global scales measuring verbal reasoning/comprehension, memory and achievement correlated significantly with each other. Less consistency was present for global scales measuring nonverbal reasoning.

Existing instruments for the assessment of intelligence in preschool children have been criticized on a number of grounds including restrictive age ranges, length of time to administer, insufficient ceilings, overemphasis on verbal skills and difficulty interpreting subtest profiles (Reynolds & Clark, 1983). Largely as a result of these criticisms and others, new instruments for the assessment of the young child have been developed. These include the Stanford-Binet Intelligence Scale: Fourth Edition (S-B:FE; Thorndike, Hagen & Sattler, 1986) and the Kaufman Assessment Battery for Children (K-ABC; A. Kaufman & N. Kaufman, 1983).

The S-B:FE is designed for use with individuals ages 2 to adult and is organized into four areas: Ver ` Reasoning (VR), Quantitative Reasoning (QR), Abstract/Visual Reasoning (AVR) and Short-Term Memory (STM). In addition, a Test Composite (TC) is provided. The K-ABC is designed to measure intelligence and achievement in children ages 2 1/2 to 12 1/2. Simultaneous (SIM) and Sequential (SEQ) processing scales are differentiated along with a separate Achievement (ACH) scale. A Mental Processing Composite (MPC) based on the processing scores is also provided.

Recently, new approaches to interpretation of these tests have been developed. Sattler (1988) has proposed the use of factor scores rather than area scores for interpretation of the S-B:FE. These factor scores are of interest as Sattler (1988, p. 261) argues that since the "area scores are not supported by factor analysis, they should n: be used for most interpretive purposes."

At the preschool level there are two factors: Verbal Comprehension (VC), composed of Vocabulary, Comprehension, Absurdities and Memory for Sentences and Nonverbal Reasoning/Visualization (NVR), composed of Pattern Analysis, Copying, Quantitative and Bead Memory. Meanwhile, Kamphaus and Reynolds (1987) have developed a procedure for computing a Verbal Intelligence Composite (VIC) and a Global Intelligence Composite (GIC) for the K-ABC. At the preschool level, the VIC is comprised of the achievement tests (Expressive Vocabulary, Faces & Places, Arithmetic and Riddles) and the GIC is formed by equally weighting the scores on the SIM, SEQ and VIC scales.

Purpose of the Study

Although the S-B:FE and K-ABC have been designed for use with preschool children, studies examining the relationships of these tests to each other in a preschool sample are limited. Several studies involving the S-B:FE are described in the <u>Technical Manual</u> for the S-B:FE. S-B:FE/K-ABC results, however, were not broken down by age group. The mean age was [illegible] years and the TC-MPC correlation was .89. A recent study (Krohn & Lamp, 1987, March) involving 89 low income preschool children revealed a correlation of .83 between the S-B:FE and K-ABC.

Likewise, studies examining the relationship between the alternative interpretive systems proposed by Sattler (1988) and by Kamphaus and Reynolds (1987) are lacking. Therefore, the present study was designed to examine the relationships among the S-B:FE and K-ABC in a nonhandicapped, preschool sample.

Method

Subjects

The sample consisted of 30 children (17 males and 13 females) from middle class, white families attending a daycare center located in a suburban area of a large midwestern city. The parents of 40 children were randomly selected and asked to participate in the study. The parents of 30 children agreed to participate for a participation rate of 75%. Parent educational level ranged from high school to post college with the majority of parents having a college degree. The children ranged in age from 3 years, 11 months to 6 years, 2 months with a mean age of 4 years, 11 months.

Procedure

Each child was administered the S-B:FE and K-ABC in counterbalanced order by school psychologists trained in the administration and interpretation of the tests. The average length of time between tests was 11 days with a range of four to 21 days. All protocols were checked for scoring accuracy prior to being included in the data analysis.

Results

Mean scores on the global scales of the S-B:FE and K-ABC were in the average range with the mean TC and MPC within one point of each other. Mean scores ranged from 104.33 to 111.13 on the S-B:FE and from 105.23 to 110.23 on the K-ABC. Mean scores, standard deviations and range are reported in Table 1.

Insert Table 1 about here

Pearson product moment correlations were calculated separately for each test and for both tests with each other. Due to the restriction in range for the tests, the correlations were corrected using a procedure developed by Guilford (1954). The correlational results for each test are presented in Table 2.

Insert Table 2 about here

All S-B:FE global scales correlated significantly with the TC at a level consistent with the correlations reported for four year olds in the standardization sample. Correlations of the AVR scale with the STM and VR scales were lower than those reported for the standardization sample (.24 vs .62 and .19 vs .62, respectively).

With the exception of the SIM-SEQ correlation, all K-ABC global scale intercorrelations were significant ($p < .05$). The overall correlations are consistent with those presented in the K-ABC Interpretive Manual for preschool children in the standardization sample as well as those described in studies of both handicapped preschool children (e.g., Lyon, Smith & Klass, 1986)and at risk preschool children (e.g., Lyon & Smith, 1986).

The results of the correlational analyses among the scales of the two instruments are reported in Table 3. These correlations ranged from a low of -.35 (VR-SIM) to a high of .75 (TC-SEQ). The correlation between the TC and MPC was .57 ($p < .001$) with the TC/ACH correlation at .65 ($p < .001$). The GIC and VIC correlations with TC were also strong ($r = .73$ and $r = .65$, respectively).

Insert Table 3 about here

A final analysis involved correlating S-B:FE and K-ABC subtests with each other. Of the 112 correlations between the S-B:FE and K-ABC, 28 or 25% of the correlations were significant ($p < .05$). Two K-ABC subtests, Gestalt Closure and Matrix Analogies, did not correlate significantly with any S-B:FE subtests. All S-B:FE subtests correlated with at least one K-ABC subtest. In addition, 13 of the 28 significant correlations involved the five K-ABC Achievement subtests with S-B:FE subtests. These correlations, corrected for restriction in range, are presented in Table 4.

Insert Table 4 about here

Discussion

Although the SIM and SEQ scales of the K-ABC are highly related to overall intelligence, their relationship to each other is minimal (r = .16) suggesting that the two scales are measuring different aspects of intelligence. At the same time, the ACH scale seems to be measuring behavior that is different from that measured by the mental processing scales as the correlations range from .36 to .55 so that a maximum of 30% of the variance can be predicted by the ACH/MPC relationship. The VIC and GIC correlations with the global scales of the K-ABC are quite similar in magnitude to the ACH and MPC correlations with the same global scales. In addition, the ACH-VIC and GIC-MPC correlations are strong (r = .99 and r = .97, respectively) and suggest the basic constructs measured by the scale with this sample of preschoolers are essentially the same with differences being in terminology only.

The AVR/VR correlation of .19 on the S-B:FE suggests that these scales are measuring different aspects of intelligence. Substantial overlap is noted between the STM and VR scales as indicated by their correlation of .81 from which 66% of the variance can be predicted.

The VC factor score proposed by Sattler produces similar correlations to the TC and area scores as the VR area score. The NVR factor score, however, produces somewhat different correlations than the AVR area score. The NVR-TC correlation of .96 is greater than the AVR-TC correlation of .76 and the NVR-VC correlation of

.63 is stronger than the VR-AVR correlation of .19. While these differences in level of correlation are not statistically significant (due to small sample size), they merit further investigation in future studies with larger samples.

In this sample of preschoolers the reorganization of subtests into two factors rather than four areas results in two factors more closely related to each other and to the TC than the original area scores. The results suggest that the VC and NVR factors are measuring similar constructs as 40% of the variance can be predicted by the VC/NVR relationship. The original area scores, VR and AVR, appeared to measure different constructs as only 4% of the variance is predicted by their relationship. By adding the Memory for Sentences subtest to the verbal factor and the Quantitative and Bead Memory subtests to the nonverbal factor, the relationship between the two constructs was altered. Clearly further investigation of this issue is needed.

In comparing performance on the S-B:FE and K-ABC the most meaningful comparisons are among those scales purportedly measuring similar cognitive skills including memory, nonverbal reasoning, verbal reasoning and overall cognitive development. Specifically, these involve STM with SEQ; AVR and NVR with SIM; QR, VR and VC with ACH; VC and VR with VIC; and TC with MPC and GIC. Those correlations are: .62 ($p < .001$) for STM-SEQ; .37 ($p < .05$) for AVR-SIM, .23 (NS) for NVR-SIM; .44 ($p < .01$) for QR-ACH, .57 ($p < .001$) for VR-ACH; .54 ($p < .001$) for VC-ACH; .55 ($p < .001$) for

VC-VIC; .52 ($p < .001$) for VR-VIC; .57 ($p < .001$) for TC-MPC and .73 ($p < .001$) for TC-GIC.

Although the TC/MPC correlation is significant ($p < .001$), the magnitude of the correlation ($r = .57$) is somewhat less than previous studies reported in the S-B:FE Technical Manual and the Krohn and Lamp (1987) study. The TC-GIC correlation, however, approaches those reported elsewhere. Since the sample in the present study was younger (mean age of 4-11), this result may be a function of the children's age.

Of particular interest in Table 3 is the pattern of correlations between the SEQ and SIM scales and the S-B:FE. All SEQ correlations are significant ($p < .01$) while only two SIM correlations are significant. The weak relationships between SIM and AVR ($r = .37$) and NVR ($r = .23$) suggest that the SIM scale on the K-ABC and the nonverbal reasoning measures on the S-B:FE are measuring different aspects of performance. While the descriptions of the constructs represented by these measures are similar, the results of this study with nonhandicapped preschoolers indicate the scales are not strongly related and that they may be measuring different constructs.

Correlations between the factor scores, VC and NVR, and the K-ABC are quite similar to the area score correlations for VR and AVR. A strong, positive relationship between verbal reasoning/comprehension on the S-B:FE and the SEQ and ACH scales on the K-ABC is indicated. This is consistent with the conclusion of

Kamphaus and Reynolds (1987) that the ACH scale at preschool levels may be a measure of verbal intelligence and related more to general intelligence than to acquired factual knowledge. Indeed, the VIC correlations with VR and VC tentatively support this as the correlations are stronger (although not statistically significant due to the small sample size). A similar relationship was found between VR and ACH by Krohn and Lamp (1987). The weak relationship between verbal reasoning/comprehension and MPC may reflect the less verbal nature of the K-ABC mental processing scales. In addition, the strong positive relationship of verbal reasoning/comprehension with SEQ and negative relationship with SIM serve to balance the relationship with the MPC which is composed of scores on the four SIM and three SEQ subtests. When the GIC score is used for these correlations, stronger correlations with both verbal reasoning (VR and VC) and nonverbal reasoning (AVR and NVR) are indicated. This probably results from the GIC including the verbally oriented achievement subtests of the K-ABC and equally weighting the SIM and SEQ scales.

The subtest correlational patterns indicate a modest overlap in the constructs measured by the subtests of the two instruments. At the same time the subtests of each instrument also measure constructs not measured by the others as shown by the number of nonsignificant subtest correlations. Four K-ABC subtests (Magic Window, Gestalt Closure, Matrix Analogies and Spatial Memory) apparently do not have direct counterparts on the S-B:FE as shown by the lack of significant correlation (Gestalt Closure and Matrix Analogies) and the significant negative correlations (Magic Window and Spatial Memory). The number of highly significant correlations ($p < .001$) is minimal and involves K-ABC sequential subtests (Number Recall with Vocabulary, Comprehension, Absurdities, Memory for Sentences, Bead Memory and Word Order with Pattern Analysis, Quantitative) and an Achievement subtest (Riddles with Vocabulary, Comprehension, Memory for Sentences and Bead Memory). Overall, 11 of the 28 significant correlations involve the S-B:FE Verbal Comprehension factor and 17 involve the S-B:FE Nonverbal Reasoning/Visualization factor. Bead Memory and Quantitative are the S-B:FE subtests with the greatest number of significant correlations with K-ABC subtests and the majority of these correlations involve K-ABC achievement subtests. Since these subtests are part of the NVR factor (Sattler, 1988) and the Achievement Scale of the K-ABC is considered to be a measure of verbal intelligence at this age range (Kamphaus and Reynolds, 1987), there is some question as to the constructs being measured by these two subtests. These results may also explain the weak relationship between the NVR and SIM scales. This issue clearly needs further investigation.

Conclusions

For this sample of nonhandicapped, preschool children adequate internal consistency was demonstrated for the S-B:FE and K-ABC. For each test global scale correlations with the full scale (TC or MPC) were significant and ranged from .76 to .90 for the S-B:FE and from .55 to .83 for the K-ABC. The VIC and GIC scores on the K-ABC produced similar correlational patterns as their counterparts (ACH and MPC), suggesting the underlying constructs are very similar. Thus, choice of score, for example, ACH or VIC, is a function of one's particular view of the subtests composing the scale. On the S-B:FE, however, use of the factor scores produced different correlational patterns. Although statistically significant results were not obtained (largely due to the small sample size), the results suggest much overlap between VC and NVR. Such overlap may limit their usefulness in program planning as their relationship suggests the constructs measured by the two factor scores are similar and that the factors may not represent distinct constructs.

Across the two tests, the global scales measuring similar traits such as verbal reasoning/comprehension, memory and achievement correlated significantly with each other. Less consistency was present for global scales measuring nonverbal reasoning. The AVR-SIM ($r = .37$) and NVR-SIM ($r = .23$) relationships suggest that the constructs represented by these scales of the S-B:FE and K-ABC are somewhat different from each other. These scales seem to be measuring different behaviors as the correlations indicate that a maximum of 14% of the variance can be predicted by the AVR-SIM relationship. On the basis of this study, scores on the two scales are not interchangeable.

A modest overlap in the constructs measured by the subtests of each instrument was indicated. The pattern of correlations suggests that the S-B:FE is the more "verbal" of the two tests and that the K-ABC is the more "nonverbal" of the two tests. While each test appears to measure the construct of intelligence, the S-B:FE seems to emphasize verbal reasoning/comprehension while the K-ABC seems to emphasize nonverbal skills at this preschool age level.

TC-MPC and TC-ACH correlations were moderate ($r = .57$ and $r = .65$, respectively) and supportive of the validity of the two instruments with this preschool sample. Differences were present, however, in the manner in which intelligence was measured by each test and the information provided by the respective test.

Several important issues have been raised by the results of the present study. At the same time these results should be interpreted cautiously as they are based on a small sample size and other studies with a similar age sample are lacking. Additional studies are greatly needed to explore these relationships and to clarify the relationship between the S-B:FE and K-ABC at the preschool level.

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Table 1

Means, Standard Deviations and Ranges for Global Scales on the S-B:FE and K-ABC

	Mean	Standard Deviation	Range
S-B:FE			
Test Composite (TC)	108.37	11.09	81-128
Verbal Reasoning (VR)	111.13	9.10	90-132
Abstract/Visual Reasoning (AVR)	107.27	13.89	77-132
Quantitative Reasoning (QR)	104.33	13.29	74-130
Short Term Memory (STM)	105.33	12.89	85-141
Verbal Comprehension (VC)	108.20	10.20	88-139
Nonverbal Reasoning/Visualization (NRV)	107.50	11.10	86-130
K-ABC			
Mental Processing Composite (MPC)	108.90	10.74	87-138
Simultaneous Processing (SIM)	110.23	11.31	86-131
Sequential Processing (SEQ)	105.23	12.99	74-135
Achievement (ACH)	106.60	10.94	88-124
Verbal Intelligence Composite (VIC)	105.77	10.02	88-121
Global Intelligence Composite (GIC)	108.17	9.97	87-131

Note. N = 30.

Table 2

Intercorrelations for the S-B:FE and K-ABC Global Scales

S-B:FE

	VR	AVR	QR	STM	VC	NVR
TC	.66(.83)*	.61(.76)*	.82(.90)*	.82(.90)*	.72(.85)*	.92(.96)*
VR		.11(.19)	.35(.55)**	.62(.81)*	.81(.92)*	.38(.60)*
AVR			.41(.49)**	.19(.2[illegible])	.13(.23)	.66(.82)*
QR				.58(.66)*	.44(.61)*	.83(.92)*
STM					.80(.91)*	.74(.85)*
VC						.45(.63)*

K-ABC

	SEQ	SIM	ACH	VIC	GIC
MPC	.73(.83)*	.77(.85)*	.44(.55)**	.48(.64)*	.93(.97)*
SEQ		.12(.16)	.43(.55)**	.40(.55)**	.74(.85)*
SIM			.27(.36)***	.35(.50)**	.67(.81)*
ACH				.98(.99)*	.73(.85)*
VIC					.77(.88)*

Note. N = 30. Correlation coefficients reported in parentheses are corrected for restriction in range via Guilford's (1954) formula.

*p < .001

**p < .01

***p < .05

Table 3

Intercorrelations among the S-B:FE and K-ABC Scales

	K-ABC					
	MPC	SEQ	SIM	ACH	VIC	GIC
S-B:FE						
TC	.44(.57)*	.63(.75)*	.06(.08)	.52(.65)*	.50(.65)*	.57(.73)*
VR	.12(.21)	.42(.63)*	-.22(-.35)***	.39(.57)*	.32(.52)*	.25(.37)***
AVR	.44(.56)*	.36(.40)**	.29(.37)***	.23(.31)	.27(.39)***	.45(.61)*
QR	.36(.47)**	.51(.54)*	.06(.08)	.34(.44)**	.31(.44)**	.43(.59)*
STM	.32(.43)**	.56(.62)*	-.02(-.03)	.55(.67)*	.51(.67)*	.49(.65)*
VC	.14(.20)	.50(.68)*	-.23(-.31)	.43(.52)*	.40(.55)*	.32(.45)**
NVR	.50(.59)*	.55(.63)*	.22(.31)	.49(.57)*	.47(.63)*	.59(.74)*

Note. N = 30. Correlation coefficients reported in parentheses are corrected for restriction in range via Guilford's (1954) formula.

*p < .001

**p < .01

***p < .05

Table 4

Significant correlations among S-B:FE and K-ABC subtests

	Vocab	Comp	Abs	PA	Copy	Quant	MFS	BM
MW					-.50(-.57)***	-.62(-.69)**		
FR				.58(.63)**				
HM			.32(.52)**					
NR	.45(.63)*	.39(.52)*	.54(.75)*			.38(.49)**	.63(.73)*	.48(.60)*
T				.47(.52)**				
WO				.46(.60)*		.51(.72)*		.33(.47)**
SM		-.54(-.68)**						
EV		.49(.63)**			.60(.70)*	.54(.64)**	.81(.88)*	
F&P								.37(.44)**
A				.38(.42)**				.38(.42)**
Rid	.36(.51)**	.48(.65)*				.33(.48)**	.42(.58)*	.40(.57)*
R/D								.49(.52)***

Note. Correlation coefficients reported in parentheses are corrected for restriction in range via Guilford's (1954) formula. Vocab = Vocabulary; Comp = Comprehension; Abs = Absurdities; PA = Pattern Analysis; Copy = Copying; Quant = Quantitative; MFS = Memory for Sentences; BM = Bead Memory; MW = Magic Window; FR = Face Recognition;

HM = Hand Movements; NR = Number Recall; T = Triangles; WO = Word Order; SM = Spatial Memory; EV = Expressive Vocabulary; F&P = Faces and Places; A = Arithmetic; Rid = Riddles; R/D = Reading/Decoding. N = 30 except for correlations with MW, FR and MW with N = 14; with SM and R/D with N = 16; and T, WO, and Rid with N = 29.

*$p < .001$

**$p < .01$

***$p < .05$