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Reynolds, C. R., & Kamphaus, R. W. (2003). *RIAS: Reynolds Intellectual Assessment Scales*. Lutz, FL: Psychological Assessment Resources, Inc.

The Reynolds Intellectual Assessment Scales (RIAS; Reynolds & Kamphaus, 2003) is an individually administered test of intelligence for use with individuals between the ages of 3 and 94. The authors have designed and incorporated subtests that emphasize fluid and crystallized abilities while excluding subtests that historically have less *g* saturation (e.g., those involving psychomotor speed), resulting in a measure that can be administered in a short period of time yet that maintains a high level of construct validity. Importantly, the authors have made a significant effort to develop a culturally fair instrument that still provides for a uniform interpretation of test scores across ethnic groups.

Theory and Characteristics

The development of the RIAS was guided by theoretical, empirical, and practical considerations. Inspired in part by Carroll's (1993) three-stratum theory of cognitive abilities and the work of Horn and Cattell (1966), the RIAS ascribes to the hierarchical construct of *g*, claiming to assess this higher order factor along with the lower order factors of crystallized and fluid intelligence. The RIAS Professional Manual presents well-reasoned arguments for this theoretical structure.

The RIAS was standardized on a normative sample of 2,438 individuals matched to the 2001 U.S. census on age, gender, educational attainment, and geographical location. Like most intelligence tests produced in the United States, the RIAS did not include normative data for Canadian populations. Thus, supplemental normative studies on a Canadian sample would be useful.

Means and standard deviations were calculated for each normative age-group. Raw scores for each subtest were then converted into standard scores ($M = 50$, $SD = 10$). The Professional Manual reports that *T* scores ($M = 50$, $SD = 10$) were selected over more traditional scaled subtest scores (i.e., scaled score mean = 10) because of higher reliability coefficients obtained for the RIAS subtest scores. Scaled scores ($M = 100$, $SD = 15$) for the three indexes are derived from the sum of the scaled scores of each subtest. Each scaled score can then be converted into percentiles, age-equivalent scores, *z*-scores, normal curve equivalents (NCEs), and stanines. Age-equivalent scores are only available for the 3-to-14 age range.

Description of Subtests

The RIAS incorporates subtests that are similar to those from other IQ measures with a long history in the field of intellectual assessment. There are a total of four intelligence subtests—two verbal and two nonverbal—as well as two conormed memory subtests that do not contribute to the composite intelligence index score. In some respects, the RIAS can be conceptualized as a brief intellectual assessment tool bundled with an extra memory test. The RIAS yields three intelligence scores: a Verbal Intelligence Index (VIX), a Nonverbal Intelligence Index (NIX), and a global Composite Intelligence Index (CIX), derived from the VIX and NIX. Administration of the four intelligence scale subtests takes approximately 20 to 25 minutes, with the two supplemental memory subtests requiring an additional 10 to 15 minutes. An even briefer intelligence test screener called the Reynolds Intellectual Screening Test (RIST; Reynolds & Kamphaus, 2003) can be administered and scored using two of the RIAS subtests (*Guess What* and *Odd-Item Out*). The RIST takes about 10 minutes to administer and covers the same age range as the RIAS. If necessary, clinicians who initially started with the RIST can easily add the two remaining subtests of the RIAS to arrive at the global CIX score.

The six subtests of the RIAS are summarized below with non-RIAS questions furnished to give the reader a sense of the items provided by the RIAS.

Verbal Intelligence Index (VIX)

Guess What (*GWH*) examinees are provided two to three clues and are required to furnish a one-word response to the concept being described (e.g., What is white, falls from the sky when it is cold, and is often used to make a snowman?). The subtest measures vocabulary knowledge, language development, fund of general information, and is similar to the Kaufman Assessment Battery for Children (K-ABC) subtest, *Riddles*.

Verbal Reasoning (*VRZ*) examinees are presented a partial analogy orally and are required to reason out a relationship among words or ideas (e.g., A soccer ball is to feet as a basketball is to _____ ?) and provide an oral response. The subtest measures verbal-analytical reasoning ability, and advanced items require more sophisticated vocabulary understanding.

Nonverbal Intelligence Index (NIX)

Odd-Item Out (*OIO*) examinees are presented pictures or designs on a single card and are required to point out the picture or design that does not belong with the others. This subtest measures nonverbal reasoning skills, spatial ability, and visual imagery. It is an adaptation to the traditional matrix reasoning subtests found on the Wechsler scales.

What's Missing (*WHM*) examinees are presented with a picture and are required to identify a part of the picture that has been intentionally omitted. Reminiscent of the picture completion subtest from the Wechsler scales, this subtest measures nonverbal reasoning abilities and the ability to analyze part-to-whole relationships.

Composite Memory Index (CMX)

Verbal Memory (*VRM*) examinees are presented with a series of sentences or developmentally appropriate stories with a common thematic element and are required to recall the sentences or the stories. This subtest attempts to measure verbal memory skills, specifically the ability to briefly store and recall verbal material.

Nonverbal Memory (*NVM*) examinees are presented with an object on a card for five seconds and then asked to identify the object just presented from among objects presented on another picture. This subtest measures nonverbal memory skills, specifically the ability to briefly store and recall visual stimuli.

Comment

The subtests of the RIAS are easily scored adaptations of those that have appeared in the batteries of the Wechsler scales and other previously developed IQ tests. Although the Picture Completion subtest was removed from the Wechsler scale's main test battery, the test publishers of the RIAS chose to resurrect an adaptation of this subtest (e.g., What's Missing) for inclusion in the RIAS. Examinees tend to enjoy this subtest, and it is easily scored by the examiner. However, the analogous subtest on the Wechsler scales had historically poor psychometric properties including low *g* loading and a high degree of cross loading with other subtests. This problem also plagues the WHM subtest. In addition, the RIAS memory subtests have met with criticism by both the test authors and independent reviewers (e.g., Elliot, 2004). The authors cautions that the memory test is not comprehensive and should be excluded from the main battery for IQ test score calculation purposes.

Administration and Scoring

Clinicians will find that the RIAS is likely the easiest and most expedient tests of intelligence on the marketplace to administer and score. All necessary instructions and administration guides are provided on the RIAS and RIST protocols. The protocols are well designed and organized with easy-to-follow start, stop, and reversal rules. This feature serves to reduce examinee scoring and administration error. Aside from the protocol and three spiral-bound booklets, there are no additional items to manipulate. The spiral-bound booklets have proven durable over extensive use. When deriving subtest or index scores, the front cover of the protocol directs the clinician to the

appropriate appendix providing normative results. On all subtests, save VRM, clinician judgment of correctness of response is minimized. The protocol furnishes objective lists of correct responses. On the VRM subtest, slight judgment may be required when scoring examinee paraphrasing of an item. Overall, the ease of scoring yielded high levels of agreement (interscorer reliability range = .95 to 1.00; *Mdn* = 1.00).

Psychometric Properties

Factor Structure

From a theoretical perspective, the test authors indicated that the development of the RIAS was guided by Horn and Cattell's (1966) *g* fluid and *g* crystallized theory, Carroll's (1993) three-stratum theory of intelligence, and the long-standing tradition of assessing verbal and nonverbal intelligence dating back to World War I (Kamphaus, 2001). The RIAS CIX provides a measure of Carroll's Stratum 3, *g*. The Stratum 2 constructs measured by the RIAS include crystallized intelligence (i.e., VIX), fluid intelligence (i.e., NIX), and memory (i.e., Composite Memory Index [CMX]). The test publishers indicate that the RIAS VIX and NIX should be considered analogous to crystallized and fluid intelligence.

Exploratory and Confirmatory Factor Analysis

The test authors used both exploratory and confirmatory factor analytic (CFA) procedures to determine the factor structure of the RIAS. The exploratory factor analytic (EFA) technique of common factors (e.g., principal factors [PFs]) with varimax rotation was used on the normative sample's five age ranges (e.g., 3 to 5, 6 to 11, 12 to 18, 19 to 94, and the total sample). According to the Professional Manual, all PF solutions for these analyses, whether investigated from a four- or six-subtest configuration, broke along a verbal-nonverbal dimension across the age ranges analyzed. However, the Professional Manual excluded commonly furnished EFA decision-making information including scree plots, communality statistics, variance accounted for by each factor, and eigenvalue levels, making a critical analysis difficult. Moreover, a PF with an oblique rotation and a higher order factor analysis using a Schmid-Leiman solution appears warranted given evidence of high correlation between the factors and considering that the RIAS was predicated upon Carroll's hierarchical theory. Finally, the factor analytic literature (e.g., Gorsuch, 1983) posits that the extraction of more than one factor with less than three variables may be untenable, suggesting that the RIAS general factor should not be overlooked.

Notwithstanding these criticisms, the PF analysis presented in the Professional Manual indicates that the RIAS has *g* saturation and is an adequate measure of

psychometric *g*. The RIAS manual reports that, across all five age-groups evaluated, the single *g* factor solution was supported. However, when a six-subtest, two-factor solution was considered, the memory subtests tended to load in the poor range, and many of the intelligence subtests had only fair loadings on the *g* factor. As a result, the test authors were appropriate to separate these two subtests from the CIX and rely on a four-subtest solution as most appropriate for clinical interpretation. Still, even with a four-subtest, two-factor solution, there is evidence of a considerable degree of cross-loading with the opposite factor at the older age ranges, particularly for the two verbal subtests and OIO.

CFA results for ages younger than 18 provide evidence for either a two-factor (VIX and NIX) or three-factor (VIX, NIX, and CMX) solution. CFA fit statistics generally confirmed any of the theoretical structures analyzed. Given the potential for confirmation bias, and in accordance with the recommendation of Carroll and others, it has been argued that primary emphasis should be placed on EFA procedures, particularly Horn's parallel analysis (HPA; Horn, 1965), the Minimum Average Partial Test (MAP; Velicer, 1976), and higher order factor analysis using a Schmid-Leiman solution (Schmid & Leiman, 1957) when attempting to elucidate the factor structure of an intelligence test. Future analyses of the RIAS standardization sample using these analyses and independent samples appear warranted before interpretation beyond a single factor can be considered completely viable.

Reliability

The RIAS demonstrates uniformly high internal consistency reliability estimates across age, gender, and ethnicity. Median Nunnally reliabilities of the respective RIAS Indexes (VIX, NIX, CIX, and CMX) by age-group were .94, .95, .96, and .95. Typically, reliability values greater than .80 for an index score are considered adequate, and reliability values greater than .90 are considered excellent. Median alpha reliability estimates for the six RIAS subtests by age-group ranged from .90 to .95. Reliability coefficients of .80 are recommended, with coefficients greater than .90 desired. In addition, test-retest reliability (stability) coefficients are high for the total sample and for the four respective index scores (VIX, NIX, CIX, and CMX) are .86, .81, .84, and .79. Stability coefficients are also available for four age-groups (3 to 4 years, 5 to 8 years, 9 to 12 years, and 13 to 82 years) and are acceptably high.

Validity

Following a brief, but instructive, overview of validity as a psychometric concept, the manual presents theory-based, logic-based, and empirical-based evidence in relation to validity on the RIAS. The validity evidence presented in the manual is instructive and well articulated.

Correlations with measures of intelligence. A new intelligence test should demonstrate a moderate-strong relationship with prior measures, generally showing a correlation greater than .70 at the full scale or composite index level. In accordance with this perspective, the relationship between the RIAS and the Wechsler scales was examined (e.g., Wechsler Intelligence Scale for Children–Third Edition [WISC-III; Wechsler, 1991] and Wechsler Adult Intelligence Scale–Third Edition [WAIS-III; Wechsler, 1997]). The sample size for both studies was small ($N = 31$ for the WAIS-III and $N = 54$ for the WISC-III), suggesting a critical need for additional replication. Concurrent validity studies provided strong support for a single-factor interpretation of the RIAS. The correlation between the RIAS CIX and the WAIS-III Full Scale IQ (FSIQ) was moderate ($r = .75$). When investigating the correlations between the RIAS and WAIS-III indices, correlations were in the range of .70 to .79. Although higher correlations were found between similar factors (i.e., RIAS VIX with WAIS-III Verbal IQ [VIQ], $r = .71$; RIAS NIX with WAIS-III Performance IQ [PIQ], $r = .71$), there was evidence of high secondary loading on the opposite factor (i.e., RIAS VIX with WAIS-III PIQ, $r = .61$; RIAS NIX with WAIS VIQ, $r = .67$).

The correlation between the RIAS CIX and the WISC-III FSIQ was moderate ($r = .76$). The RIAS VIX and CIX correlated highly with WISC-III VIQ ($r = .86$ and $r = .81$, respectively). However, the RIAS NIX correlated higher ($r = .60$) with the WISC-III VIQ than it did with the WISC-III PIQ ($r = .33$, *ns*). As a result of this correlation, Bracken (2005) commented that the RIAS is primarily a verbally loaded test. The Professional Manual offered an explanation for this counterintuitive result. The manual indicated that the lower correlation is likely attributable to the increased emphasis of the WISC-III PIQ on motor and language skills relative to the RIAS Nonverbal Index. In addition, the WISC-III PIQ required sequencing (e.g., Picture Arrangement) and speed of performance, both of which are not emphasized on the RIAS. When examining the RIAS–WISC-III correlation matrices (see Professional Manual, Table 6.10, p. 106), several nonsignificant correlations emerged between the RIAS subtests and the WISC-III subtests of Coding, Picture Arrangement, Symbol Search, and Object Assembly. These WISC-III subtests rely to varying degrees on psychomotor speed, sequencing, and speed of performance; therefore, it becomes apparent that such abilities are not assessed by the RIAS and the test author's explanation seems supportable.

Correlations with measures of academic achievement. To evaluate the relationship between the RIAS and academic achievement, 78 children and adolescents were administered the RIAS and the Wechsler Individual Achievement Test (WIAT; The Psychological Corporation, 1992). The RIAS Indexes of VIX, NIX, CIX, and CMX demonstrated respective correlations of .73, .41, .69, and .58 with the WIAT Total composite. Of the RIAS indexes, the RIAS VIX consistently demonstrated the highest correlations with the WIAT: Reading ($r = .67$), Math ($r = .67$), Language ($r = .70$), and Writing ($r = .61$) composites. The RIAS NIX demonstrated the lowest correlations,

ranging from .35 (Language) to .46 (Mathematics). These scores are commensurate with the predictive validity of other longer standardized tests. Thus, the RIAS presents with strong predictive value for educational achievement.

Consequential validity evidence. An impressive feature of the Professional Manual is its documentation of consequential validity evidence. The manual discusses extensive efforts at minimizing cultural and gender bias in the RIAS. Both objective (e.g., differential item functioning) and subjective (e.g., expert consensus) item bias studies were undertaken, which resulted in the removal of many items and the modification of still others.

Conclusion

The RIAS represents the newest intelligence test on the marketplace and incorporates the most current intelligence test theory and an expedient, user-friendly approach to test administration. The RIAS also incorporates a brief intelligence screening test, the RIST. The RIST uses two RIAS subtests and requires only 10 minutes to administer. Although the RIAS may be expediently administered, it provides a global measure of intelligence consistent with tests more than twice its length. The Professional Manual is instructive, and the discussion of reliability, validity, and subtest analysis is particularly informative. Questions remain about the factor structure of the RIAS and whether it can be interpreted beyond a single factor. Additional factor analytic studies of the standardization sample as well as studies on independent samples are recommended.

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