



Raven's Standard Progressive Matrices (SPM)

Evidence of Reliability and Validity





Copyright © 2007 by NCS Pearson, Inc.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the copyright owner.

Pearson and **TalentLens** logos are trademarks, in the U.S. and/or other countries, of Pearson Education, Inc. or its affiliate(s).

Portions of this work were previously published.

Printed in the United States of America.

Raven's Standard Progressive Matrices (SPM)

Evidence of Reliability and Validity

Internal Consistency Reliability

The internal consistency reliability estimate for the *Standard Progressive Matrices* (SPM) total raw score was .88 in the standardization sample of 793 individuals. (See the Appendix for more details regarding the composition of the sample.) This reliability estimate indicates that the total raw score on the SPM possesses good internal consistency reliability as provided in the guidelines of the U.S. Department of Labor (1999, p. 3–3) for interpreting a reliability coefficient.

Content Validity

In an employment setting, evidence of content validity exists when an assessment includes a representative sample of tasks, behaviors, knowledge, skills, abilities, or other characteristics necessary to perform the job. Evidence of content validity is usually gathered through job analysis.

The SPM has been widely used for decades as a measure of *eductive ability*—“the ability to evolve high-level constructs which make it easier to think about complex situations and events” (Raven, Raven, & Court, 1998, p. G8). In an extensive analysis of the cognitive processes that distinguish between higher-scoring and lower-scoring examinees on the SPM and the *Advanced Progressive Matrices* (APM), Carpenter, Just, and Shell (1990) described the Raven's Progressive Matrices as “a classic test of *analytic intelligence* ... the ability to reason and solve problems involving new information, without relying extensively on an explicit base of declarative knowledge derived from either schooling or previous experience” (p. 404). In an employment setting, evidence of the content-related validity of the SPM should be established by demonstrating that the jobs for which the SPM is to be used require the problem-solving skills measured by the assessment.

Convergent Validity

Evidence of convergent validity is provided when scores on an assessment relate to scores on other assessments that claim to measure similar traits or constructs. Years of previous studies on the SPM support its convergent validity (Raven, Raven, & Court, 2000). For example, in a sample of 26 adults, SPM scores correlated with scores on the subtests of the *Wechsler Adult Intelligence Scale III* as follows: *Matrix Reasoning* (.81), *Performance IQ* (.79), *Full Scale IQ* (.64), and *Verbal IQ* (.49) (The Psychological Corporation, 1997). Another study of 288 individuals in various age groups found that SPM scores correlated between .74 and .84 with *Full Scale IQ* scores on the *Wechsler Adult Intelligence Scale–Revised* (O’Leary, Rusch, & Guastello, 1991). Furthermore, in a study of 452 Egyptian university students, SPM scores correlated .60 with the spatial orientation test of an Arabic version of *Thurstone’s Primary Mental Abilities* battery (*PMA Space*), .46 with the *PMA Inductive Reasoning* test, and .31 with *PMA Verbal* (Abdel-Khalek, 1988).

Evidence of convergent validity for the current version of the SPM is supported by two findings. First, in the standardization sample of 793 individuals, scores on the current SPM correlated .97 with scores on the previous SPM. Second, in a subset of 129 individuals from the standardization sample, the revised SPM scores correlated .43 with scores on the *Watson-Glaser Critical Thinking Appraisal®—Short Form*. Detailed evidence regarding the validity of the Watson-Glaser as a measure of critical thinking and reasoning appears in the Watson-Glaser Short Form Manual (Watson & Glaser, 2006).

Criterion-Related Validity

Criterion-related validity addresses the inference that individuals who score better on an assessment will be more successful on some criterion of interest. Criterion-related validity for general mental ability tests like the SPM is supported by validity generalization. The principle of validity generalization refers to the extent that inferences from accumulated evidence of criterion-related validity from previous research can be generalized to a new situation.

There is abundant evidence that measures of general mental ability, such as the SPM, are significant predictors of overall performance across jobs. For example, in its publication on the *Principles for the Validation and Use of Personnel Selection Procedures*, the Society for Industrial and Organizational Psychology (2003) notes that validity generalization is well-established for cognitive ability tests. Schmidt & Hunter (2004) provide evidence that general mental ability “predicts both occupational level attained and performance within one’s chosen

occupation and does so better than any other ability, trait, or disposition and better than job experience” (p. 162). Prien, Schippmann, and Prien (2003) observe that decades of research “present incontrovertible evidence supporting the use of cognitive ability across situations and occupations with varying job requirements” (p. 55). Many other studies provide evidence of the relationship between general mental ability and job performance (e.g., Kolz, McFarland, & Silverman, 1998; Kuncel, Hezlett, & Ones, 2004; Ree & Carretta, 1998; Salgado, et al., 2003; Schmidt & Hunter, 1998; Schmidt & Hunter, 2004).

In addition to inferences based on validity generalization, studies using the SPM over the past 60 years provide evidence of its criterion-related validity. For example, in a validation study of assessment centers, Chan (as cited in Ree & Carreta, 2002) reported that scores on the Raven’s Progressive Matrices correlated with ratings of participants on “initiative/creativity” (p.14). Another group of researchers (Gonzalez, Thomas, & Vanyukov, 2005) reported a positive relationship between scores on the Raven’s SPM and performance in decision-making tasks. The *SPM Manual* (Raven, Raven, & Court, 2000) provides additional information indicating that the SPM validly predicts the ability of an individual to attain and retain jobs that require high levels of general mental ability.

The validity information presented in this guide is not intended to serve as a substitute for locally obtained validity data. Local validity studies, together with locally derived norms, provide a sound basis for determining the most appropriate use of the SPM. Therefore, whenever technically feasible, users of the SPM should study the validity of the assessment at their own location or organization.

Appendix

Description of the Sample

The information provided in the following tables is based on SPM data collected during the period May, 2006 through May, 2007.

Appendix 1. Composition of the Sample by Occupation (*n* = 793)

Occupation*	
Accountant; Auditor	0.9%
Admin Assistant; Secretary; Office Support	0.3%
Airline Pilot/Navigator	0.1%
Architect	0.1%
Assistant Manager	0.1%
Assistant Store Manager	0.1%
Attorney	0.4%
CEO	0.1%
Consultant	1.8%
Customer Service Representative	0.8%
Department Manager	0.1%
Engineer	0.3%
Farm Worker	0.1%
Financial Analyst	0.5%
Food Service	0.1%
Human Resources Occupations	1.0%
Information Technology Occupations	4.0%
Installation/Maintenance/Repair	0.3%
MD, DO, DDS, etc.	0.1%
Not Applicable	30.5%
Nurse	0.1%
Other	4.3%
Paralegal	0.3%
Psychologist	0.4%
Sales Representative (Non-Retail)	1.3%
Sales Representative (Retail)	7.1%
Store Manager	0.3%
Teaching Occupations	0.1%

* Three hundred and fifty-three individuals did not provide a response about their occupation.

Appendix 2. Composition of the Sample by Position Level (*n* = 793)

Position Level*	
Executive; Director	4.8%
Manager	18.8%
Supervisor	0.9%
Professional/Individual Contributor	4.8%
Hourly/Entry-Level	0.8%
Blue-Collar	0.4%
Self-Employed/Business Owner	0.4%
Not Applicable	24.7%

* Three hundred and fifty-three individuals did not provide a response about their position level.

References

- Abdel-Khalek, A. M. (1988). Egyptian results on the Standard Progressive Matrices. *Personality and Individual Differences, 9*(1), 193–195.
- Carpenter, P. A., Just, M. A., & Shell, P. (1990). What one intelligence test measures: A theoretical account of the processing in the Raven's Progressive Matrices test. *Psychological Review, 97*(3), 404–431.
- Gonzalez, C., Thomas, R. P., & Vanyukov, P. (2005). The relationship between cognitive ability and dynamic decision making. *Intelligence, 33*, 169–186.
- Kolz, A. R., McFarland, L. A., & Silverman, S. B. (1998). Cognitive ability and job experience as predictors of work performance. *The Journal of Psychology, 132*(5), 539–548.
- Kuncel, N. A., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of Personality and Social Psychology, 86*(1), 148–161.
- O'Leary, U., Rusch, K. M., & Guastello, S. J. (1991). Estimating age-stratified WAIS-R IQ's from scores on the Raven's Standard Progressive Matrices. *Journal of Clinical Psychology, 47*(2), 277–284.
- Prien, E. P., Schippmann, J. S., & Prien, K. O. (2003). *Individual assessment as practiced in industry and consulting*. Mahwah, NJ: Erlbaum.
- Raven, J., Raven, J. C., & Court, J. H. (2000). *Raven manual: Section 3, standard progressive matrices, including the parallel and plus versions, 2000 edition*. Oxford, UK: Oxford Psychologists Press Ltd.
- Raven, J., Raven, J. C., & Court, J. H. (1998). *Raven manual: Section 1, general overview, 1998 edition*. Oxford, UK: Oxford Psychologists Press Ltd.
- Ree, M. J., & Carretta, T. R. (1998). General cognitive ability and occupational performance. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology* (Vol. 13, pp. 159–184). Chichester, England: Wiley.
- Ree, M. J., & Carretta, T. R. (2002). g2K. *Human Performance, 15*, 3–23.
- Salgado, J. F., Anderson, N., Moscoso, S., Bertua, C., & Fruyt, F. (2003). International validity generalization of GMA and cognitive abilities: A European community meta-analysis. *Personnel Psychology, 56*, 573–605.

- Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, 124, 262–274.
- Schmidt, F. L., & Hunter, J. (2004). General mental ability in the world of work: Occupational attainment and job performance. *Journal of Personality and Social Psychology*, 86(1), 162–173.
- Society for Industrial and Organizational Psychology. (2003). *Principles for the validation and use of personnel selection procedures* (4th ed.). Bowling Green, OH: Author.
- The Psychological Corporation. (1997). *Wechsler adult intelligence scale – Third edition: Technical Manual*. San Antonio, TX: Author.
- U.S. Department of Labor. (1999). *Testing and assessment: An employer's guide to good practices*. Washington, DC: Author.
- Watson, G. B. & Glaser, E. M. (2006) *Watson–Glaser critical thinking appraisal short form manual*. San Antonio, TX: Harcourt Assessment, Inc.

