DOCUMENT RESUME

ED 426 109 TM 029 343

AUTHOR	Prediger, Dale J.
TITLE	Basic Structure of Work-Relevant Abilities.
INSTITUTION	American Coll. Testing Program, Iowa City, IA.
REPORT NO	ACT-RR-98-9
PUB DATE	1998-10-00
NOTE	42p.
AVAILABLE FROM	ACT Research Report Series, P.O. Box 168, Iowa City, IA 52243-0168.
PUB TYPE	Numerical/Quantitative Data (110) -- Reports - Research (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Ability; Career Choice; Educational Practices; Factor Analysis; *High School Seniors; High Schools; Intelligence; *Self Evaluation (Individuals); *Student Interests; Tables (Data)
IDENTIFIERS	*Hollands Theory of Occupational Choice

ABSTRACT

This study sought to determine whether the dimensions underlying a comprehensive set of 15 work-relevant abilities were similar to the Data/Ideas and Things/People Work Task Dimensions (D. J. Prediger, 1996) underlying J. L. Holland's (1997) hexagonal model of interest and occupational types. The work task dimensions and a general ability dimension served as factor targets in principal components analyses of ability self-estimates obtained from nationally representative and cross-sectional samples of 4,387 and 618 12th graders. The composition of the factors that were extracted corresponded to expectations based on the work task dimensions and Holland's hexagon. Implications for practice are noted. Study results also suggest the need for a new look at the structure of human intelligence. (Contains 6 tables, 2 figures, and 47 references.) (Author)

ACT Research Report Series 98-9

Basic Structure of Work-Relevant Abilities

Dale J. Prediger

October 1998

For additional copies write:
ACT Research Report Series
PO Box 168
Iowa City, Iowa 52243-0168

Basic Structure of Work-Relevant Abilities

Dale J. Prediger

Table of Contents

Page

Abstract

This study sought to determine whether the dimensions underlying a comprehensive set of 15 work-relevant abilities were similar to the Data/Ideas and Things/People Work Task Dimensions (D. J. Prediger, 1996) underlying J. L. Holland's (1997) hexagonal model of interest and occupational types. The work task dimensions and a general ability dimension served as factor targets in principal components analyses of ability self-estimates obtained from nationally representative and cross-sectional samples of 4,387 and 618 12th graders. The composition of the factors that were extracted corresponded to expectations based on the work task dimensions and Holland's hexagon. Implications for practice are noted. Study results also suggest the need for a new look at the structure of human intelligence.

Acknowledgments

This paper is based, in part, on a conference presentation (Prediger, 1998a). Mark Houston identified schools for the nationally representative sample. Jane Staples identified schools for the cross-sectional sample and managed all data collection phases of this study. Kyle Swaney assisted with the development of student score reports and interpretive materials provided to participating schools. The author is also grateful for the help of Adam Burton, who prepared the figures and assisted with the numerous manuscript revisions.

Basic Structure of Work-Relevant Abilities

Using ability and interest measures to help people identify and explore personally relevant occupational options would be easier if abilities, interests, and occupations had the same basic structure. This is not guaranteed, of course, by having ability scales, skill scales, interest scales, and occupational (job) families with the same names. Regarding skill self-confidence measures, Campbell, Hyne, and Nilsen (1992) noted that "Little is known about the structure of skills compared with the structure of interests" (p. 65)—even when skill and interest scales have the same names, as in the Campbell Interest and Skill Survey (CISS; Campbell et al., 1992). Although much is known about the structure of abilities assessed by tests (e.g., see Anastasi & Urbina, 1997; Carroll, 1993), there appears to be no basis in the professional literature for expecting ability structure to agree with interest structure. Perhaps the reasons are due to the nature of research on ability structure.

As discussed below, ability test batteries seldom (if ever) assess a *comprehensive* set of work-relevant abilities. On the other hand, interest measures are almost always work-world comprehensive—the numerous measures of Holland's (1997) six interest types being noteworthy examples. Regarding Holland's two-dimensional, hexagonal model of relationships among types (Figure 1), structural (factor, multidimensional scaling) analyses of interest score intercorrelations (Prediger, 1982, 1997; Rounds, 1995) support the Data/Ideas and Things/People Work Task Dimensions proposed by Prediger (1976), as does research *external* to those analyses (e.g., see Prediger, 1996). But what about dimensions underlying work-relevant abilities?

Purpose and Overview of Study

The general purpose of this study was to determine the basic structure (factors, dimensions) underlying a comprehensive set of work-relevant abilities. Contrary to factor-analytic studies of cognitive abilities (Carroll, 1993, located 1,500 such studies), this study sought to identify ability structure by using a search strategy based on psychological theory rather than arbitrary statistical rules (e.g., positive manifold, simple structure). In that only three potential dimensions were examined, the *basic* structure of work-relevant abilities was addressed.

This study is also contrary to the many factor-analytic studies of cognitive abilities in that scores were available for a comprehensive set of work-relevant abilities. The study included seven abilities frequently assessed by "paper-and-pencil" tests. But it also included eight additional abilities. Although each of the study's 15 work-relevant abilities (see Table 1) has undoubtedly been assessed in one way or another, it does not appear that scores for all (or most) of the abilities have been analyzed for underlying structure. (Tables and figures appear at the end of this report.) The work-relevant abilities of nationally representative and cross-sectional samples of 4,387 and 618 12th graders provided the basis for the study's structural analyses.

Specifically, study analyses were designed to determine whether the structure of work-relevant abilities parallels the Data/Ideas and Things/People Work Task Dimensions underlying Holland's hexagonal model of relationships among interest ("personality") and occupational types. The study used these two work task dimensions and a general ability dimension as targets in principal components analyses of work-relevant ability scores. That a general ability dimension is relevant to Holland's theory was demonstrated by Gottfredson and Holland (1996), who assigned Holland types to over 12,000 occupations in the U.S. Department of Labor (U.S. DOL) *Dictionary of Occupational Titles* (U.S. DOL, 1991). For each occupation, they also developed and provided an index of "Complexity Level" (p. 723) in order to indicate "cognitive complexity of work demands" (p. 723).

Comprehensive Assessment of Work-Relevant Abilities

Prediger (in press) discussed general considerations regarding the use of ability and interest measures for the purpose of career exploration and planning—i.e., in a work-world search for occupations with client-compatible work tasks. Much of this section summarizes that discussion.

Limitations of Ability Tests

Although ability test batteries typically assess only three to six abilities beyond the three Rs (e.g., see Kapes, Mastie, & Whitfield, 1994, for test reviews), common sense and research involving job analysis data and ability test scores (e.g., see Dawis, Dohm, Lofquist, Chartrand, & Due, 1987; Desmarais & Sackett, 1993; Prediger, 1989) indicate that there are many more work-relevant abilities. For example, Holland, Fritzsche, and Powell (1994) identified 12; Lowman (1991) identified 11; and Jones (1996) cited 17 on the basis of U.S. DOL studies.

Researchers and career counselors cannot obtain test scores for multiple, work-relevant abilities unless tremendous time and effort are expended on their part and on the part of sample members and counselees. For these reasons and others (e.g., see Prediger, in press), non-test abilities may be dealt with haphazardly, at best, in research on ability structure and in career counseling.

Ability Self-Estimates as Alternatives to Tests

Over 40 years ago, Donald Super (1957) noted that "In choosing an occupation one is, in effect, choosing a means of implementing a self-concept" (p. 196). Ability self-estimates directly reflect self-concepts. Hence, it is not surprising that one popular alternative to gaps in test coverage of work-relevant abilities is the use of self-estimates. Whereas ability test scores can be based on narrow, abstract operational definitions (consider items on the typical spatial relations and clerical perception tests), abilities that are to be self-estimated can be broadly defined in work-relevant terms. Ability self-estimates are variously obtained, as illustrated by the Ability Explorer (Harrington & Harrington, 1996), CHOICES (Careerware, 1992), and the Self-Directed Search (SDS; Holland et al., 1994). However, one needs to be alert to the many problems that must be overcome (Mabe & West, 1982). The procedure used in this study was to obtain ability self-estimates informed by experience, first-hand and vicarious. (See Prediger, 1992, for a discussion of informed self-estimates of abilities.)

Ability self-estimates are sometimes assumed to be inaccurate. However, research (e.g., see the Mabe & West, 1982, review) indicates that the accuracy of ability self-estimates depends on how they are obtained—just as it does for ability test scores. Because both test scores and self-estimates may be inaccurate for given individuals, *both may be the problem* if correlations between test scores and self-estimates are low.

Validity Comparisons for Ability Tests and Self-Estimates

Given that ability test scores and self-estimates may both have psychometric problems, the question is: Which is more valid—the way persons understand their abilities (not an unimportant matter in life) after years of experience and feedback from friends, colleagues, and people they serve; or the way tests score their abilities after 6, 14, or even 21 minutes (per ability) of foil selecting, figure image unfolding or rotating, rapid digit-string matching, rapid mark-in-box making, etc.? Stated differently, which has the greater validity for the application at hand (career exploration and planning)—ability tests or self-estimates? In their review, Mabe and West (1982) concluded as follows: "It appears that under certain measurement conditions, self-evaluation of ability may closely correspond to performance on criterion measures" (p. 294). Some recent evidence is summarized below.

Bases for validity comparisons. As documented by Prediger (1998b), a common way to determine an instrument's validity for career exploration and planning is to find the percentage of criterion group (e.g., occupational choice group) members who are predicted, on the basis of their scores, to be members of the criterion group to which they belong—that is, to determine the instrument's "hit rate." A report by ACT (1998) summarized the results of four studies that compared hit rates for ability tests (six to ten scores used in combination) with hit rates for six Holland-type ability composites based on test scores plus self-estimates for nine work-relevant abilities not assessed by the tests. Also summarized were the results of a fifth study that compared the hit rate for six ability test scores with (a) the hit rate for self-estimates of the same six abilities, and (b) the hit rate for six Holland-type ability composites obtained from 15 self-estimates.

Each of the five studies used an early form of the instrument used to obtain ability self-estimates in the current study. One study involved 11th graders (N = 529); three involved 12th graders (Ns = 1,669; 2,101; and 3,768); and one involved college students (N = 7,008). In each study, hit rates for the six Holland-type criterion groups were determined following a discriminant analysis. The chance hit rate was 17% (1/6).

Results of validity comparisons. For tests, alone, total hit rates ranged from 28% to 39% across the five studies. For the ability composites using self-estimates, hit rates ranged from 34% to 43%. In each of the five studies, ability composites using self-estimates had higher hit rates (were more valid). The proportional improvement over ability test hit rates ranged from .08 to .48. In the study comparing test-score and self-estimate hit rates for the same six abilities, self-estimates had the higher hit rate. If the hit rates had been equal, the self-estimates would still have saved about 90 minutes in test administration time (and related expenses).

Regarding "yes—but." One might argue that ability self-estimates had higher hit rates than test scores because the former reflect interests—and, hence, affect occupational choice. (This implies that the "true abilities" assessed by tests should not and do not affect occupational choice.) The relatively low correlations between ability self-estimates and interest scores (see Variables section) are relevant to this argument. Of further relevance are analyses of the independent validity (Prediger, in press) of ability and interest measures. These analyses (ACT, 1998) were conducted for three samples, two of which were used in the current study (see Method section). The third (*N* = 2,101) was described by Prediger and Brandt (1991). The independent validity analyses showed that self-estimates for the abilities included in the current study had substantial hit rates for persons who were interest inventory misses. Furthermore, when Holland types for the highest ability and interest scores agreed, the hit rate was substantially higher than the hit rate for either assessment alone.

The five studies comparing the career exploration validity of ability tests and self-estimates appear to be unique. More usually, ability measures are used to predict "success" in various endeavors. In this regard, Baird (1976) cited massive evidence favoring ability self-estimates over test scores in the prediction of school and college grades—perhaps the most frequent use of ability tests. In an update of Baird's review, Katz (1993) found similar evidence.

On Self-Estimates as Assessments of "True Abilities"

As someone who has worked for 28 years for a major producer of ability tests and as someone who, at one time, was responsible for the production of academic ability tests (e.g., the "ACT") and vocational ability tests, the author is familiar with ability test batteries. Also, I recognize there are those who believe that ability test scores are far more valid than ability self-estimates. Some would hold that test scores (and only test scores) can portray "true abilities." My own position is that test scores provide estimates of the abilities people actually possess. For somewhat different reasons (see below), both *test estimates* and *self-estimates* of abilities may be flawed.

Certainly, ability self-estimates can be subject to distortion—e.g., due to response style, limited experience, deliberate enhancement. Regarding the latter, I do not propose the use of ability self-estimates in awarding scholarships or screening job applicants. However, in the study reported here, subjects had no reason to distort. It was in their self-interest to be as insightful and truthful as they could be.

Vocational ability test scores are also subject to distortion—e.g., due to response style (preferred work pace, tendency to guess, degree of motivation, etc.), limited experience (with figure image unfolding, digit-string matching, etc.), deliberate enhancement (cheating), operationally narrow definitions of abilities (as evidenced by item content). In addition, tests do not provide efficient (not to mention valid) measures of many work-relevant abilities. Hence, these abilities are ignored—or they are variously "assessed" via conversation (self-report) and "scored" in case notes, perhaps.

For the above reasons, the answer to the question, "Which provides the better representation of a person's work-relevant abilities—test estimates or self-estimates?", requires validity evidence. Validity evidence from five studies was summarized above. (Also see Baird, 1976, and Katz, 1993.) Given the evidence, I hope readers will understand when I present informed self-estimates as *useful approximations* of "true abilities."

Method

Variables

The previous section makes a case for the use of ability self-estimates in order to obtain a comprehensive assessment of work-relevant abilities. This study obtained informed self-estimates of 15 abilities via the Inventory of Work-Relevant Abilities (IWRA).

Overview of IWRA development. The ACT (1998) report cited above describes the theory, research, and career counseling considerations resulting in the identification of the 15

IWRA abilities (Table 1). The four basic work tasks noted above—working with data, ideas, things, and people—had a major role in IWRA's development. For this reason, and because the Data/Ideas and Things/People Work Task Dimensions served as targets in this study's structural analyses, abbreviated definitions of these work tasks are provided below.

Data tasks: *Impersonal* tasks involving procedures and transactions that expedite goods/services consumption by people (e.g., by organizing, recording, verifying, or transmitting facts, numbers, instructions, etc.).

Ideas tasks: *Intrapersonal* tasks involving insights, theories, and new ways of expressing something (e.g., with words, paint, equations, music).

Things tasks: *Nonpersonal* tasks involving machines, tools, living things (e.g., cattle), body parts (e.g., teeth), and materials such as food, wood, or metal.

People tasks: *Interpersonal* tasks such as caring for, educating, entertaining, serving, persuading, or directing others.

Although any occupation may involve some work with data, ideas, things, and people, only one or two of the work tasks typically predominate. For example, a scientist may work with data, but the primary purpose is not to produce or handle data. Rather, it is to create or apply scientific knowledge.

As noted above, research indicates that bipolar combinations of the four work tasks (data/ideas, things/people) underlie Holland's hexagonal arrangement of types. Figure 1 depicts relationships between the two work task dimensions and Holland's hexagon. These relationships, the work task definitions, and empirical data on the abilities of persons pursuing a wide range of occupations provided the bases for identifying the 15 IWRA abilities (ACT, 1998). Although work-world comprehensive in that they address each of six Holland's types, the 15 abilities are not presented as exhausting the pool of abilities relevant to the work world. Rather, a relatively small number of abilities was sought in order to facilitate practical applications in career counseling.

Overview of IWRA. When completing IWRA, persons see the Table 1 definitions of the abilities *plus* everyday activities to consider. (IWRA instructions and items are provided by ACT, 1998.) For example, the definition for the ability, organization, is followed by: "Consider your ability to keep to a schedule; to see what needs to be done first, second, etc.; to store things (pictures, clippings, tools, etc.) so they are easy to find."

IWRA asks persons to report ability estimates "compared to persons [their] own age" on a 5-point scale. They are provided with brief descriptions of each scale position. For example: "5 = high (top 10%)"; "2 = below average (lower 25%)." After estimates have been made for each of the 15 abilities, persons are asked to review and compare their estimates, as a whole, and then revise them if they wish.

In career counseling applications such as DISCOVER (ACT, 1995), a computer-based career planning system, IWRA self-estimates are combined into norm-based composite scores for six career clusters paralleling Holland's six types. (The ACT, 1998, report explains how the composite scores are obtained.) Because the ability composites are groupings of abilities similar to factors, they were not used in this study. Instead, analyses involved all 15 ability self-estimates.

Relationships of IWRA abilities to interests. As noted in the "yes—but" section, one may ask whether self-estimates of work-relevant abilities merely reflect work-relevant interests. Independent and agreement validity data provided in the ACT (1998) report have already been summarized. The report also provides correlations for Holland-type pairs of interest scales and self-estimate composites—to be called "inter-individual correlations." For each of four samples (three were nationally representative; two were included in this study), abilities were assessed by

IWRA and interests were assessed by the Unisex Edition of the ACT Interest Inventory (UNIACT; Swaney, 1995). The inter-individual correlations for parallel IWRA composites and UNIACT scales were generally in the forties. The median correlations were .45, .43, .43, and .40—indicating about 18% variance in common.

Although career counseling is typically based on multi-score profiles, inter-individual correlations address only one pair of scales at a time. In contrast, *intra*-individual correlations summarize the relationship, obtained one individual at a time, between the individual's scores on corresponding ability and interest scales. Because intra-individual correlations summarize the relationship of ability and interest profile shapes across individuals, they are relevant to the use of ability and interest measures in career counseling and to research on the structure of work-relevant abilities (i.e., abilities and interests could have identical profile shapes across individuals but inter-individual correlations could be low or negative). What, then, is the relationship between ability and interest profile shapes?

Because intra-individual correlations are obtained one person at a time, the median correlation and range are typically reported. For this study's two samples, the IWRA-UNIACT median correlations were .54 and .53: The correlations ranged from about -1.00 to +1.00 in both samples (ACT, 1998). These results indicate substantial differences in ability and interest profile shapes for given individuals.

Samples

Analyses of the basic structure of work-relevant abilities were conducted on IWRA scores obtained from two samples. Sample A consisted of 4,387 12th graders in a nationally representative sample of 49 schools. All students completed both IWRA and UNIACT. To enhance motivation, they were promised (and received) a report of their IWRA and UNIACT results. Swaney (1995) provided a description of the sample (racial-ethnic background, etc.), which is the basis for IWRA and UNIACT Grade 12 national norms.

Sample B consisted of 618 12th graders in two urban, two suburban, and two rural schools in six states (Alabama, Arizona, Colorado, Idaho, Iowa, and Ohio). All students completed both IWRA and UNIACT. The racial-ethnic distribution was as follows: African-American (11%); American Indian (1%); Caucasian-American (56%); Mexican-American (18%); Asian-American (2%); Puerto-Rican, Cuban, or other Hispanic origin (2%); and other (1%). (Nine percent preferred not to respond or had missing data.) Study measures were administered to students (53% female) in intact classes; there was no student self-selection. As with Sample A, students received a report of their IWRA and UNIACT results.

Results

Regular Principal Components Analysis (PRINCO)

IWRA intercorrelations for Samples A and B (Tables 2 and 3) were initially subjected to a regular (unconstrained) PRINCO. All 15 IWRA abilities correlated substantially with the first principal component (median correlations of .48 for both samples), thus indicating a General factor, but not necessarily a general mental ability factor (see Discussion section). For both samples, the same four abilities had positive or negative correlations of .40 or higher with the second principal component (factor). These abilities (i.e., manual dexterity and mechanical abilities vs. meeting people and helping others) clearly indicate a Things/People factor. The five abilities with positive or negative correlations of .40 or higher on each sample's third component (i.e., clerical, numerical, and organizational abilities vs. artistic and literary abilities) provide good support for a Data/Ideas factor. Thus, when there is a comprehensive assessment of abilities *and* when General factor variance is not allowed to contaminate subsequent factors (e.g., through a rotation procedure such as varimax), the ability factors that emerge are similar to commonly identified interest factors.

Targeted PRINCO

Overview of procedure. A targeted PRINCO (hereafter called "targeted factor extraction") was used to determine the extent to which the basic structure of work-relevant abilities corresponds to the dimensions underlying Holland's hexagon. As noted in the paper's introduction, Prediger (1976) proposed the Data/Ideas and Things/People Work Task Dimensions depicted in Figure 1. Other hexagon dimensions have also been proposed (e.g., see Hogan, 1983). However, in a three-way multidimensional scaling analysis involving 77 interest inventory intercorrelation matrices (N = 41,672), Rounds and Tracey (1993) showed that these dimensions do not explain more variance. Because studies external to intercorrelation-based interest structure studies support the Data/Ideas and Things/People Work Task Dimensions (Prediger, 1996), these dimensions served as targets in this study of ability structure.

Prediger (1982) demonstrated how a targeted factor extraction procedure (Overall, 1962) could be used to determine the extent to which interest scale intercorrelations support the two work task dimensions (factors). The procedure, which targets orthogonal factors, was applied to IWRA intercorrelations for Sample A and Sample B. Relative weights (see Table 4) were assigned to each of the 15 abilities according to their expected relationships with the Data/Ideas and Things/People factors and Holland types. The weights are relative in that, for a given factor, only their size relative to each other matters. As noted above, the factors are orthogonal; hence, comparisons of weights across factors are not warranted.

In effect, the targeted weights were assigned to abilities by considering where the abilities should be located on Figure 1, given their definitions, the definitions for the four work tasks, and the definitions of six Holland types. Thus, as indicated in Table 4, mechanical ability and manual dexterity (associated with Holland's Realistic type) were targeted to have a high, positive correlation with the Things/People factor (weights of +2); whereas meeting people and helping others (associated with Holland's Social type) were targeted to have a high, negative correlation (weights of -2). None of these four abilities was targeted to correlate with the Data/Ideas factor. Clerical ability (associated with Holland's Conventional type) and Leadership ability (associated with Holland's Enterprising type) were assigned weights of +1 and −1 on the Things/People factor—in accordance with the relative positions of those types on Holland's hexagon. As shown by Table 4, several abilities (clerical and leadership included) were targeted to correlate with both factors. One ability, reading, was not targeted to correlate with either factor because of its general applicability to work tasks and Holland types.

In addition to work task factors, a general factor was extracted through use of a target vector of equal weights for the 15 IWRA abilities. Such a factor, which is common to basic interest scales using Likert-type responses (e.g., see Prediger, 1998b; Rounds & Tracey, 1993), directly affects profile level on interest score reports. Prediger (1998b) provided results for three samples (*N*s = 3,612; 4,645; and 386,836) indicating that, for basic interest scales, profile level indicates response style, not strength of interest. Regarding work-relevant ability structure, the general factor's nature is more complex (see Discussion section).

Results. The variance accounted for (VAF) by each of the three targeted factors is reported in Table 5. Highly similar VAFs were obtained for the two samples. As in Prediger's (1982, 1997) interest inventory analyses, the General factor accounted for the largest proportion of variance. Correlations of IWRA abilities with the General factor are shown in Table 6.

In order to determine whether the targeted factor extraction procedure was overfitting the data, VAFs were compared with those from the regular PRINCO reported above. The regular PRINCO's factor extraction targets are statistically defined so as to maximize VAF. The question, then, is how do VAFs obtained for ability dimension targets constrained by psychological theory (i.e., Holland's hexagonal model) compare with VAFs based on PRINCO's "unconstrained" targets?

As shown by Table 5, total VAFs for the unconstrained factors and targeted factors are nearly identical. The fit index (last column of Table 5) shows that the targeted factors account for 98% of the variance available to three factors. Thus, there appears to be no reason for concern about overfitting. Prediger (1982, 1997) obtained similar results for 10 interest inventories assessing Holland's types (47 samples).

Figure 2 is based on the Sample A and Sample B correlations of the 15 abilities with the targeted Data/Ideas and Things/People factors. The ability locations, which indicate their correlations with the targeted factors, are highly similar for the two samples. More important, ability locations with respect to the two factors and Holland types are generally as one would expect on the basis of definitions of the abilities, work tasks, and Holland types.

Discussion

Universality of Work Task Dimensions?

Applicability across career-relevant domains. This study sought to determine whether the basic structure of work-relevant abilities is similar to that of interests and occupations—as depicted by Holland's (1997) hexagon and its underlying Data/Ideas and Things/People Work Task Dimensions (Prediger, 1976, 1996). Study results, summarized by Figure 2, correspond to expectations based on Holland's hexagon and its two dimensions. As expected, a General factor was also obtained. The VAFs for the three extracted factors totaled about 50%, thus suggesting additional dimensions of work-relevant abilities. Unfortunately, Holland's theory does not indicate the nature of such dimensions. Exploratory, atheoretical analyses may provide clues.

Regarding other career-relevant domains, results of research involving U.S. DOL job analysis data for a large cross-section of occupations (Prediger, 1981) also support the two work task dimensions. (Occupations are defined by their work tasks.) Structural analyses of intercorrelations of the mean interest scores of persons grouped by (a) college major, (b) occupational choice, and (c) occupation indicate that the two work task dimensions sensibly differentiate career groups in each of the three categories (Prediger, 1982). Furthermore, data for two sets of occupations spanning Holland's types indicate that the mean interests of occupational incumbents are highly related to their work tasks (Prediger, 1982).

In effect, a visual summary of the above results is provided by the World-of-Work Map (ACT, 1988; Prediger, Swaney, & Mau, 1993), which shows the locations of 23 job families on the Data/Ideas and Things/People Work Task Dimensions. The mean interest scores of persons in 991 career groups and U.S. DOL job analysis data for the 12,000 occupations were used to assign occupations to job families and to determine job family locations on the map (ACT, 1988).

Support for the two work task dimensions has also been reported by Tracey (1997), who conducted a PRINCO of the intercorrelations of the self-efficacy beliefs of college students regarding occupational activities (i.e., self-ratings of competence in performing 224 work tasks). In a different career-relevant domain, Rolfhus and Ackerman (1996) conducted a study involving UNIACT and 32 self-report scales assessing academically specialized knowledge (total of 552 specialized knowledge questions). When they correlated the knowledge scale scores of college students with data/ideas and things/people scores based on UNIACT, they found "a relatively close correspondence between students' self-reports of knowledge and their expression of vocational interests" (p. 182).

Finally, given the widely recognized career relevance of general mental ability (*g*), structural analyses of the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981) appear to be pertinent. Because the WAIS-R is individually administered, it can assess a wider variety of abilities (cognitive and performance) than typically assessed by ability test batteries. Silverstein (1987) conducted a PRINCO (and two similar structural analyses) on intercorrelations for the 11 WAIS-R subtests, as reported for the standardization sample. His results supported three factors.

Silverstein labeled the first (unrotated) factor "Spearman's *g*" (p. 384). It had, by far, the largest VAF. The second *bipolar* factor mainly differentiated verbal (e.g., Vocabulary) from performance (e.g., Object Assembly) subtests. Although people-related tasks are only tangentially covered by the WAIS-R, this factor would seem to suggest a people-things contrast. The third *bipolar* factor mainly differentiated the Digit Span and Digit Symbol subtests from the Picture Completion and Picture Arrangement subtests. Silverstein labeled this dimension "Freedom from Distractibility" (p. 384). However, it would also seem to suggest a data-ideas contrast. In their analyses of WAIS-R "factor profiles" (p. 63), Moses and Pritchard (1995) obtained results similar to those obtained by Silverstein.

Applicability to the structure of intelligence. The results of the present study, together with those summarized above, suggest that abilities may have the same basic structure as vocational interests, occupations, work task self-efficacy beliefs, and specialized knowledge. If so, a new look at the structure of human intelligence may be warranted. Anastasi and Urbina (1997) note that the term intelligence "is commonly used to cover that combination of abilities required for *survival and advancement* [italics added] within a particular culture" (p. 296). Because contributing to society through work is essential to survival and advancement in Western (if not all) cultures, it is surprising that no one appears to have investigated the structure underlying work-relevant abilities—certainly not via a comprehensive assessment or from the perspective of psychological theory.

In concluding a review of recent literature on human abilities, Sternberg and Kaufman (1998) noted that "The field particularly needs research that expands our notions about what intelligence is" (p. 498). Through the use of a comprehensive set of work-relevant abilities, this study attempted to expand notions regarding the basic structure of abilities needed for human survival and advancement. In this respect, study procedures were more in accord with Gardner's (1993) theory of multiple intelligences and Sternberg's (1996) theory of successful intelligence than with test-determined, cognitive-only, statistically based "theories" of intelligence.

Occupations (means of survival) require the performance of basic work tasks—working with people, things, data, and ideas. With what else can one work? Has the structure of human intelligence been shaped accordingly?

Nature of General Factor

The first principal component to appear in each of the two regular PRINCOs had relatively high correlations with all 15 abilities (medians of .48 for both samples). General factor correlations obtained in the targeted factor extractions are shown in the first two columns of Table 6. As suggested by the medians of .51 and .50 for Samples A and B, respectively, these correlations were highly similar to those obtained in the regular PRINCOs. (VAFs are reported in Table 5.) Data and speculation regarding the nature of the General factor are provided below. Certainly, it can not be considered to be a pure measure of general cognitive ability.

Relevance of response style. As noted in the Targeted PRINCO section, a general factor is common to basic interest scales using Likert-type responses. In a study involving Holland-type scales for five well-known interest inventories (nine samples of Grade 6-12 students), Prediger (1998b) obtained a median correlation of about .70 between the interest scales and the general interest factor. As noted above, he also provided evidence that the general interest factor represents response style and not strength of interest.

Of course, response style (albeit a different type of response style) may also affect ability self-estimates. To gain perspective on this, an ability profile level score was obtained for each student in Sample A and Sample B by summing the student's scores for the 15 IWRA abilities. Correlations of the 15 abilities with the profile level scores (medians of .49 and .52 for Samples A and B, respectively) were highly similar to the correlations with the General factor shown in Table 6. Likewise, an interest profile level score (i.e., response style score) was obtained for students in both samples by summing their standard scores for the six UNIACT interest scales. The ability profile level scores and interest response style scores correlated .49 and .44 for the two samples, indicating 24% and 19% variance in common.

Correlations between the 15 abilities and interest inventory response style are shown in Table 6. The median correlations (.24 and .23) are much lower than the median correlations (.51 and .50) between the 15 abilities and the IWRA General factor. Thus, it appears that interest-inventory-like response style is reflected only to a modest extent in the individual ability self-estimates.

Relevance of general cognitive ability. Unfortunately, the extent to which the IWRA General factor reflects general cognitive ability, as assessed by paper-and-pencil tests, could not be determined for Samples A and B. (Tests were not administered to sample members.) However, scores for an early form of IWRA and for reading, numerical, and language usage tests (ACT, 1988) were available for a third sample (to be called Sample C) consisting of 529 Grade 11 students in three schools in three Midwestern states (Prediger & Swaney, 1992, Appendix C). A test-based academic ability composite was obtained by summing the reading, numerical, and language usage standard scores of each student in Sample C. This composite would appear to provide a reasonable proxy for general cognitive ability.

Correlations between the 15 work-relevant abilities and the ability composite are reported in Table 6. Although the median correlation (.23) is low, the range (-.02 to .53) is substantial, and the low and high correlations generally make good sense. (The ability composite correlated .71 with the sum of the self-estimates for the same three abilities.) More important, the IWRA profile level score for Sample C correlated .53 with the ability composite (results not reported in Table 6), thus indicating 28% variance in common with the general cognitive ability proxy.

Possible relevance of other variables. Study results suggest that the IWRA General factor reflects both general cognitive ability (VAF of 28%) and response style (VAFs of 24% and 19%—see above). However, about 50% of its variance remains "unexplained." Contributors to this unexplained variance may include general level of functioning with respect to data, ideas, things, and people work tasks—to the extent that this differs from general cognitive ability. Contributors may also include response style variance unique to ability self-estimates—for example, level of optimism or pessimism regarding self, in general, and/or one's specific abilities. With respect to occupational self-efficacy beliefs, Tracey (1997) obtained a correlation of .56 between a general factor and global self-esteem. Correlations between self-esteem and Tracey's Data/Ideas and Things/People factors were -.05 and .10, respectively. Given the above findings, the nature of the General factor obviously warrants further study.

Implications for Practice

Work task scores. The existence of a common, basic structure underlying abilities, interests, and occupations could substantially facilitate the coordinated use of assessment results in career exploration and planning. (Otherwise, one must deal with apples, oranges, and bananas.) This paper summarized prior evidence supporting the Data/Ideas and Things/People

Work Task Dimensions and presented new evidence for work-relevant abilities. The evidence supports use of ability self-estimates to obtain locations on the two work task dimensions—hence, Holland's hexagon. Prediger et al. (1993) illustrated how this can be done through use of the World-of-Work Map, an extension of Holland's hexagon. Just as with interest scores, World-of-Work Map job families in line with ability scores are good candidates for exploration.

Ability level scores. The extent to which a person scores approach a given pole on a work task dimension (e.g., Things/People) indicates the extent to which the person's self-reported ability to deal with corresponding work tasks (e.g., working with people) exceeds the person's ability to deal with work tasks characterizing the opposite pole (e.g., working with things). Stated differently, relative strengths and weaknesses are shown—just as with the shape of an ability test profile. Contrary to a test profile, which supposedly indicates "ability level" in an absolute sense (but, actually, indicates ability level in comparison to a norm group), ability level is not directly indicated by scores on the bipolar work task dimensions. Thus, ability level needs to be separately addressed—just as in any assessment interpretation based on *highest* scores (e.g., Holland three-letter codes).

It is possible that the General factor obtained in this study will prove useful as an indicator of level of ability in comparison to other persons. In this regard, it is important to recall that the General factor is uncorrelated, in a *linear* sense, with the Data/Ideas and Things/People factors. However, if the relationship is *curvilinear*, a high score on the General factor, coupled with a score near the Data factor pole (for example), could indicate a high level of data-related ability. The same holds for ideas, people, and things work tasks. This is a matter deserving further study.

Coordinated interpretations. In summary, the extent to which ability level is represented by work task scores or by this study's General factor is unclear. However, as discussed by

Prediger (in press) and illustrated by a case study, sources of information on the level of *specific* abilities (including non-test sources) can be consulted as *specific* occupational options are considered. That is, the information sources can be tailored to the occupational options under consideration, thus making the information-collection task more manageable.

Because they indicate strongest abilities, ability scores for the two work task dimensions can be used to suggest occupational options worth considering. Because the same work task dimensions underlie interests, the tandem use of ability and interest measures in career counseling should be easier—easier to explain and easier to defend.

References

American College Testing. (1988). *Interim psychometric handbook for the 3rd edition ACT Career Planning Program.* Iowa City, IA: Author.

American College Testing. (1995). *DISCOVER for Colleges and Adults: Professional Manual.* Hunt Valley, MD: Author.

American College Testing. (1998). *Career Planning Survey technical manual.* Manuscript in preparation.

Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed.). Englewood Cliffs, NJ: Prentice Hall.

Baird, L. (1976). *Using self-reports to predict student performance* (Research Monograph Number 7). New York: College Entrance Examination Board.

Campbell, D. P., Hyne, S. A., & Nilsen, D. L. (1992). *Manual for the Campbell Interest and Skill Survey.* Minneapolis, MN: National Computer Systems.

Careerware: ISM Systems Corporation. (1992). *CHOICES* [Computer software]. Ottawa, Ontario: Author.

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies.* New York: Cambridge University Press.

Dawis, R. V., Dohm, T. E., Lofquist, L. H., Chartrand, J. M., & Due, A. M. (1987). *Minnesota Occupational Classification System II: A psychological taxonomy of work.* Minneapolis: University of Minnesota Department of Psychology.

Desmarais, L. B., & Sackett, P. R. (1993). Investigating a cognitive complexity hierarchy of jobs. *Journal of Vocational Behavior, 43,* 279-297.

Gardner, H. (1993). *Multiple intelligences: The theory in practice.* New York: Basic Books.

Gottfredson, G. D., & Holland, J. L. (1996). *Dictionary of Holland occupational codes* (3rd ed.). Odessa, FL: Psychological Assessment Resources.

Harrington, J. C., & Harrington, T. F. (1996). *Ability Explorer: Preliminary technical manual.* Chicago: Riverside Publishing.

Hogan, R. (1983). A socioanalytic theory of personality. In M. M. Page (Ed.), *Nebraska symposium on motivation 1982. Personality—Current theory and research* (pp. 55-89). Lincoln, NE: University of Nebraska Press.

Holland, J. L. (1997). *Making vocational choices* (3rd ed.). Odessa, FL: Psychological Assessment Resources.

Holland, J. L., Fritzsche, B. A., & Powell, A. B. (1994). *The Self-Directed Search technical manual.* Odessa, FL: Psychological Assessment Resources.

Jones, L. K. (1996). *Job skills for the 21st Century: A guide for students.* Phoenix: Oryx Press.

Kapes, J. T., Mastie, M. M., & Whitfield, E. A. (Eds.). (1994). *A counselor's guide to career assessment instruments* (3rd. ed.). Alexandria, VA: National Career Development Association.

Katz, M. R. (1993). *Computer-assisted career decision-making: The guide in the machine.* Hillsdale, NJ: Lawrence Erlbaum.

Lowman, R. L. (1991). *The clinical practice of career assessment: Interests, abilities, and personality.* Washington, DC: American Psychological Association.

Mabe, P. A., III, & West, S. G. (1982). Validity of self-evaluation ability: A review and meta-analysis. *Journal of Applied Psychology, 67,* 280-296.

Moses, J. A., Jr., & Pritchard, D. A. (1995). Modal profiles for the Wechsler Adult Intelligence Scale—Revised. *Archives of Clinical Neuropsychology, 11,* 61-68.

Overall, J. E. (1962). Orthogonal factors and uncorrelated factor scores. *Psychological Reports, 10,* 651-662.

Prediger, D. J. (1976). A world-of-work map for career exploration. *Vocational Guidance Quarterly, 24,* 198-208.

Prediger, D. J. (1981). Getting "ideas" out of the DOT and into vocational guidance. *Vocational Guidance Quarterly, 29,* 293-306.

Prediger, D. J. (1982). Dimensions underlying Holland's hexagon: Missing link between interests and occupations? *Journal of Vocational Behavior, 21,* 259-287.

Prediger, D. J. (1989). Ability differences across occupations: More than *g*. *Journal of Vocational Behavior, 34,* 1-27.

Prediger, D. J. (1992, March). Conditions related to the accuracy of ability self-estimates. In D. Prediger (Chair), *Beyond the `ASVAB code': Using the other ASVAB aptitude scores to expand career exploration.* Symposium conducted at the meeting of the American Association for Counseling and Development, Baltimore.

Prediger, D. J. (1996). Alternative dimensions for the Tracey-Rounds interest sphere. *Journal of Vocational Behavior, 48,* 59-67.

Prediger, D. J. (1997, May). *Integrating interests with abilities.* Paper presented at the national conference on vocational interests held by the Society for Vocational Psychology, Lehigh University, Bethlehem, PA.

Prediger, D. J. (1998a, July). *Basic structure of work-relevant abilities*. Paper presented at the global conference held by the National Career Development Association, Chicago, IL.

Prediger, D. J. (1998b). Is interest profile level relevant to career counseling? *Journal of Counseling Psychology, 45,* 204-211.

Prediger, D. J. (in press). Integrating interests and abilities for career exploration: General considerations. In M. L. Savickas & A. R. Spokane (Eds.), *Vocational interests: Their meaning, measurement, and counseling use*. Palo Alto, CA: Davies-Black.

Prediger, D. J., & Brandt, W. E. (1991). Project CHOICE: Validity of interest and ability measures for student choice of vocational program. *Career Development Quarterly, 40,* 132-144.

Prediger, D. J., & Swaney, K. B. (1992). *Career counseling validity of DISCOVER's Job Cluster Scales for the revised ASVAB score report* (ACT Research Report No. 92-2). Iowa City, IA: American College Testing.

Prediger, D. J., Swaney, K., & Mau, W-C. (1993). Extending Holland's hexagon: Procedures, counseling applications, and research. *Journal of Counseling and Development, 71,* 422-428.

Rolfhus, E. L., & Ackerman, P. L. (1996). Self-report knowledge: At the crossroads of ability, interest, and personality. *Journal of Educational Psychology, 88,* 174-188.

Rounds, J. B. (1995). Vocational interests: Evaluating structural hypotheses. In R. V Dawis & D. Lubinski (Eds.), *Assessing individual differences in human behavior: New concepts, methods, and findings* (pp. 177-232). Palo Alto, CA: Consulting Psychologists' Press.

Rounds, J., & Tracey, T. J. (1993). Prediger's dimensional representation of Holland's RIASEC circumplex. *Journal of Applied Psychology, 78,* 875-890.

Silverstein, A. B. (1987). Multidimensional scaling vs. factor analysis of Wechsler's intelligence scales. *Journal of Clinical Psychology, 43,* 381-386.

Sternberg, R. J. (1996). *Successful intelligence*. New York: Simon Schuster.

Sternberg, R. J., & Kaufman, J. C. (1998). Human abilities. *Annual Review of Psychology, 49,* 479-502.

Super, D. E. (1957). *The psychology of careers*. New York: Harper & Brothers.

Swaney, K. B. (1995). *Technical manual: Revised Unisex Edition of the ACT Interest Inventory (UNIACT)*. Iowa City, IA: American College Testing.

Tracey, T. J. G. (1997). The structure of interests and self-efficacy expectations: An expanded examination of the spherical model of interests. *Journal of Counseling Psychology, 44,* 32-43.

U.S. Department of Labor. (1991). *Dictionary of occupational titles* (4th ed., Rev. 1991, Vols. 1-2). Washington, DC: U.S. Government Printing Office.

Wechsler, D. (1981). *WAIS-R manual: Wechsler Adult Intelligence Scale—Revised.* New York: Psychological Corporation.

TABLE 1

Definitions of Work-Relevant Abilities

Abilities	Definitions
	Abilities typically measured by tests
Reading	Reading and understanding factual material (e.g., in a textbook or manual)
Numerical	Doing arithmetic accurately and quickly; applying arithmetic (e.g., in formulas and word problems)
Language usage	Recognizing correct and incorrect uses of the English language (grammar, punctuation, etc.)
Scientific	Understanding science laws; doing science course work
Spatial perception	Looking at a drawing of an object (e.g., a house, coat, tool) and picturing in your mind how it would look from different sides
Mechanical	Understanding everyday mechanical laws (e.g., warm air rises) and how simple mechanical things work (e.g., a lever, a pulley)
Clerical	Quickly and accurately doing tasks such as looking up information in catalogs or tables, sorting things, recording addresses or expenses, etc.
	Abilities for which test scores are seldom available
Meeting people	Talking with people; getting along with others; making a good impression
Helping others	Caring for or teaching others; helping people with problems or decisions
Sales	Influencing people to buy a product, service, or take a suggested course of action
Leadership-Management	Leading and/or managing people so that they work toward a common goal
Organization	Keeping track of tasks and details; doing things in a systematic way
Creative-Literary	Expressing ideas or feelings through writing
Creative-Artistic	Drawing, painting, playing a musical instrument, acting, dancing, etc.
Manual dexterity	Making or repairing things easily and quickly with one's hands

Note. These definitions, along with examples of everyday experiences, are used to obtain informed self-estimates of abilities via the Inventory of Work-Relevant Abilities (ACT, 1998).

TABLE 2

Work-Relevant Ability Intercorrelations: Sample A (National)

	Work-relevant ability														
Work-relevant ability	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Meeting people	—														
2. Helping others	.48	—													
3. Sales	.29	.19	—												
4. Leadership-Mgmt.[a]	.36	.29	.43	—											
5. Organization	.16	.19	.18	.33	—										
6. Clerical	.14	.16	.24	.23	.42	—									
7. Mechanical	-.07	-.07	.13	.10	.07	.08	—								
8. Manual dexterity	-.02	-.06	.13	.13	.08	.07	.65	—							
9. Numerical	.07	.08	.18	.23	.27	.33	.25	.24	—						
10. Scientific	.07	.10	.11	.17	.15	.14	.36	.31	.40	—					
11. Creative-Artistic	.18	.16	.11	.15	.07	.04	.10	.18	.00	.17	—				
12. Creative-Literary	.25	.26	.20	.24	.15	.18	.00	.06	.06	.21	.49	—			
13. Reading	.21	.17	.18	.20	.18	.23	.08	.13	.15	.27	.24	.46	—		
14. Language usage	.27	.24	.22	.26	.22	.26	.03	.08	.19	.25	.24	.48	.55	—	
15. Spatial perception	.11	.07	.18	.20	.14	.13	.37	.46	.19	.30	.33	.24	.25	.26	—
Mean	4.0	4.0	3.0	3.5	3.5	3.2	3.1	3.1	3.3	3.1	3.4	3.3	3.5	3.5	3.3
SD[b]	1.0	1.0	1.1	1.1	1.1	1.1	1.3	1.2	1.2	1.2	1.3	1.2	1.1	1.0	1.1

Note. N = 4,387.

[a]Mgmt. = Management. [b]SD = standard deviation.

TABLE 3

Work-Relevant Ability Intercorrelations: Sample B (Cross-Sectional)

	Work-relevant ability														
Work-relevant ability	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Meeting people	—														
2. Helping others	.49	—													
3. Sales	.25	.13	—												
4. Leadership-Mgmt.[a]	.42	.29	.48	—											
5. Organization	.26	.22	.24	.42	—										
6. Clerical	.18	.21	.25	.22	.37	—									
7. Mechanical	-.04	-.03	.22	.14	.04	.17	—								
8. Manual dexterity	-.05	-.04	.19	.11	.05	.11	.66	—							
9. Numerical	.02	-.05	.25	.20	.21	.29	.26	.24	—						
10. Scientific	.03	.12	.15	.16	.12	.12	.35	.27	.35	—					
11. Creative-Artistic	.19	.19	.10	.14	.05	.01	.18	.20	-.09	.11	—				
12. Creative-Literary	.23	.28	.19	.19	.17	.13	.07	.13	.04	.17	.44	—			
13. Reading	.11	.23	.19	.22	.19	.18	.17	.19	.17	.34	.17	.43	—		
14. Language usage	.26	.29	.21	.26	.23	.24	.11	.16	.15	.20	.27	.46	.55	—	
15. Spatial perception	.06	.08	.21	.16	.10	.10	.42	.46	.21	.24	.35	.24	.24	.22	—
Mean	4.0	4.0	2.9	3.6	3.4	3.1	3.0	3.0	3.2	3.2	3.5	3.3	3.4	3.5	3.3
SD[b]	1.0	1.0	1.1	1.1	1.1	1.1	1.3	1.3	1.2	1.2	1.3	1.2	1.1	1.0	1.1

Note. N = 618.

[a]Mgmt. = Management. [b]SD = standard deviation.

TABLE 4

Targeted Factors in Structural Analysis of Work-Relevant Ability Intercorrelations

			Targeted factors and weights[a]		
Work-relevant ability		Abbreviation[b]	Data/Ideas	Things/People	General
1.	Meeting people	MEET	0	-2	+1
2.	Helping others	HELP	0	-2	+1
3.	Sales	SELL	+1	-1	+1
4.	Leadership-Management	LEAD	+1	-1	+1
5.	Organization	ORGZ	+1	0	+1
6.	Clerical	CLER	+1	+1	+1
7.	Mechanical	MECH	0	+2	+1
8.	Manual dexterity	MDEX	0	+2	+1
9.	Numerical	NUM	+1	+1	+1
10.	Scientific	SCI	-1	+1	+1
11.	Creative-Artistic	ART	-1	0	+1
12.	Creative-Literary	LIT	-1	-1	+1
13.	Reading	READ	0	0	+1
14.	Language usage	LANG	-1	-1	+1
15.	Spatial perception	SPACE	-1	+1	+1

[a]Factors (principal components) were extracted in the order shown. Weights are relative *within* each factor. Comparisons across factors are not warranted. [b]Abbreviations are used in factor loading plots (Figures 2 and 3).

TABLE 5

Variance Accounted for by Unconstrained and Targeted Factors

in Structural Analysis of Work-Relevant Abilities

	Unconstrained factors[a]				Targeted factors[b]				Fit index[c]
Sample	1st	2nd	3rd	All 3	GF	T/P	D/I	All 3	
A. National	26%	14%	10%	50%	26%	13%	10%	49%	98%
B. Cross-sectional	26	14	11	50[d]	26	13	10	49	98

Note. Factors were determined by principal components analyses.

[a]Factors were obtained by regular principal components analysis. [b]For reasons discussed in the text, the following factors were targeted in addition to a General factor (GF): Data/Ideas (D/I) and Things/People (T/P). Table 4 provides the extraction order. [c]Variance accounted for (VAF) by three targeted factors as a percentage of VAF by the three unconstrained factors (the maximum possible for three factors). [d]Does not equal sum of three factors due to rounding.

TABLE 6

Correlations of Work-Relevant Abilities with the General Factor,

Interest Inventory Response Style, and Test-Based Academic Ability

	Correlations for Samples A, B, and C				
	General factor[a]		Response style[b]		Academic ability[c]
Work-relevant ability	A	B	A	B	C
1. Meeting people	.44	.44	.24	.18	.03
2. Helping others	.41	.43	.27	.24	.04
3. Sales	.51	.54	.29	.25	.09
4. Leadership-Management	.58	.59	.28	.24	.23
5. Organization	.50	.49	.18	.19	.39
6. Clerical	.51	.49	.23	.23	.17
7. Mechanical	.43	.51	.19	.22	.07
8. Manual dexterity	.47	.50	.23	.21	-.02
9. Numerical	.51	.45	.23	.21	.53
10. Scientific	.53	.49	.28	.26	.47
11. Creative-Artistic	.43	.42	.25	.23	.11
12. Creative-Literary	.53	.53	.28	.24	.24
13. Reading	.55	.57	.22	.21	.49
14. Language usage	.58	.59	.24	.23	.42
15. Spatial perception	.55	.54	.29	.20	.25
Median	.51	.50	.24	.23	.23

[a]Results are based on the targeted factor extraction. [b]Correlation with sum of UNIACT scores for Holland (1997) types. [c]Correlation with sum of scores for following tests: Reading, Numerical, and Language Usage. See the unanticipated Sample C analyses discussed in the section titled "Nature of General Factor."

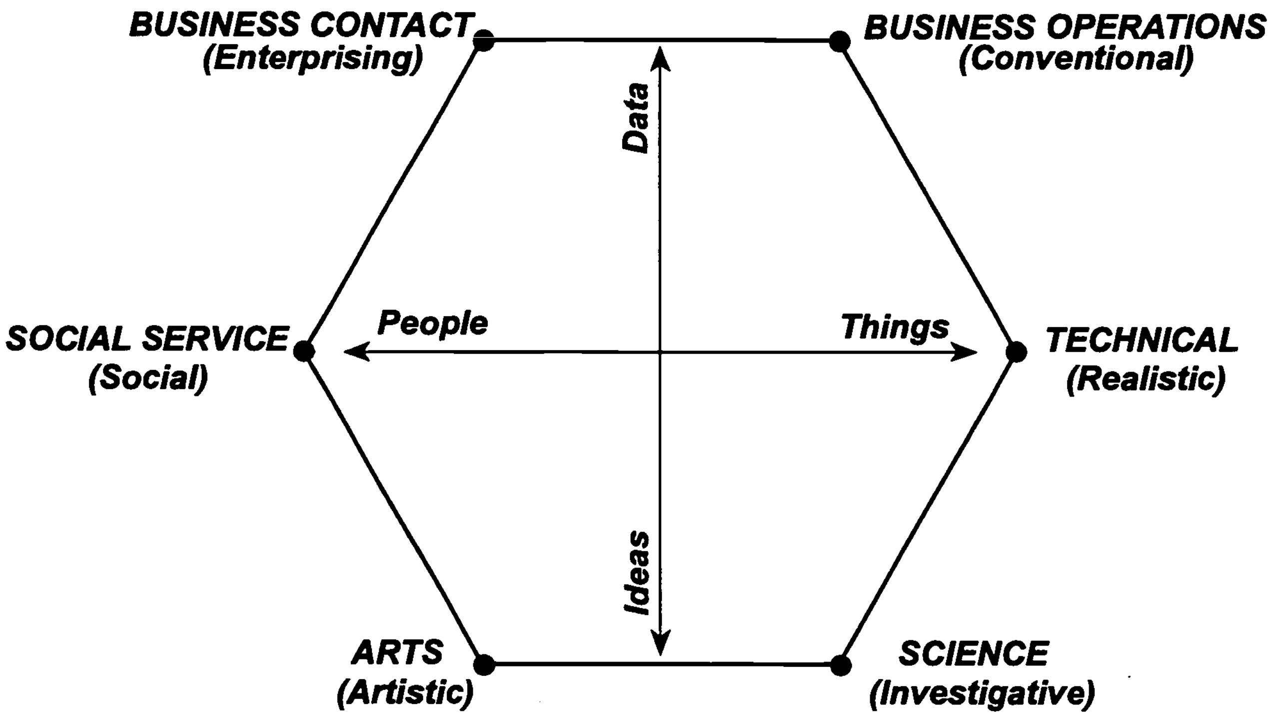

FIGURE 1. Holland's hexagonal model of occupational, interest, etc. types and underlying work task dimensions. Holland (1997) types appear in parentheses below alternative titles (Prediger, Swaney, & Mau, 1993).

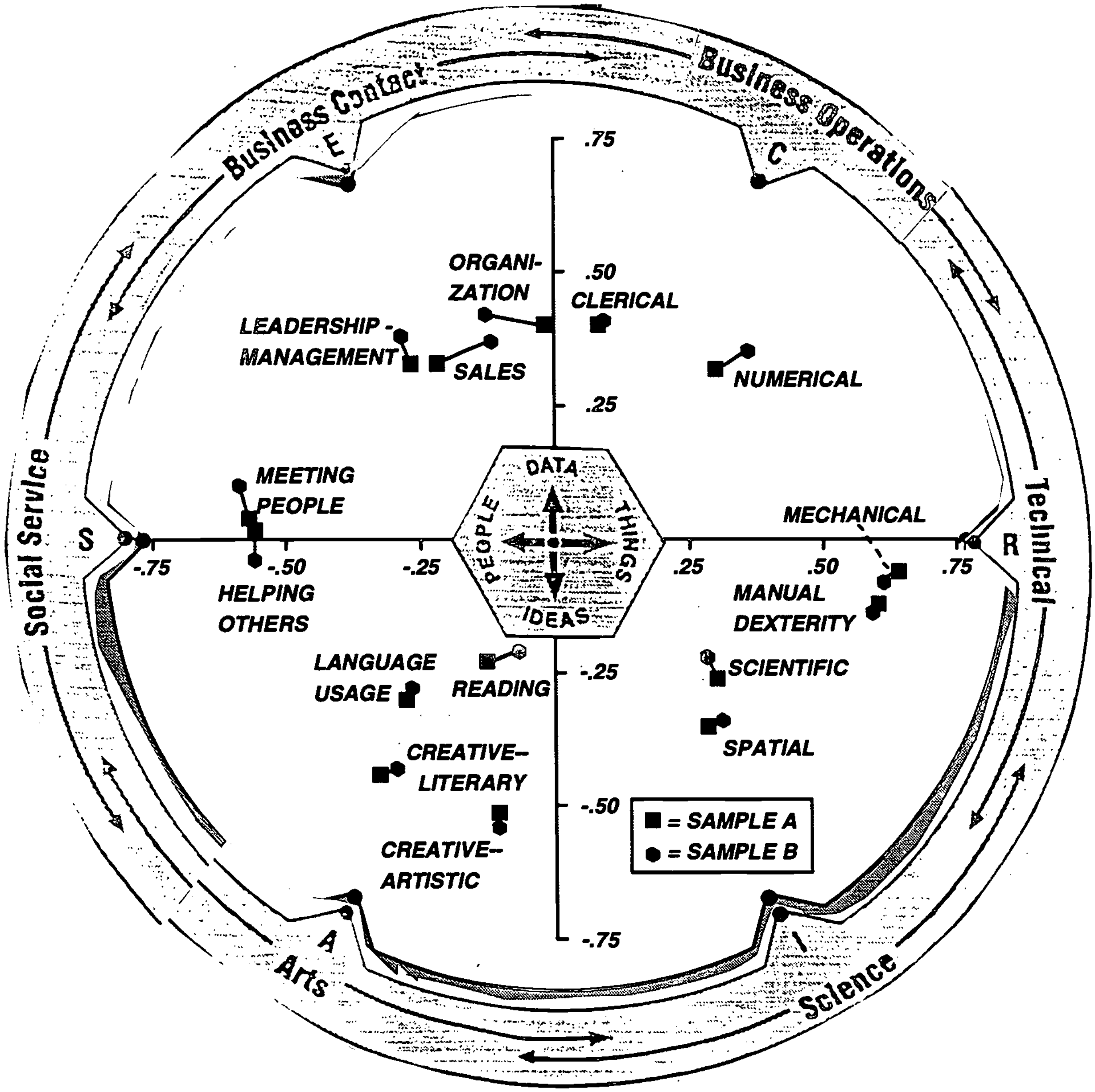

FIGURE 2. Correlations of abilities with Data/Ideas and Things/People factors. Selected correlation scale intervals are shown (e.g., .25, .50). Abbreviations for Holland (1997) types and alternative titles (Prediger, Swaney, & Mau, 1993) appear on the figure's periphery. Abbreviations are as follows: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C).

BEST COPY AVAILABLE

NOTICE

REPRODUCTION BASIS

☑ This document is covered by a signed "Reproduction Release (Blanket) form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").