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PSYCHOMETRIC CHARACTERISTICS OF A VOCATIONAL PREFERENCE INVENTORY SHORT FORM[1,2]

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This article presents reliability and validity evidence for Form B of Holland's Vocational Preference Inventory (VPI), a 42-item short form which was further reduced to 30 items for this study. The psychometric properties of this revised scale were assessed by using employees from five Federal Government organizations as respondents (N=2621). Factor analyses, interscale correlations, measures of internal consistency, and criterion group profiles are presented and discussed. All data, with some minor exceptions, support the utility of this form in research studies in which longer instrumentation cannot be used because of space or other limitations. In general, the evidence was supportive of both the construct (factorial) and criterion-related validity of the newly devised 30-item form of the VPI.

Two primary instruments have been used in research and in professional practice to measure Holland's (1973) theory of "occupational personalities": the Vocational Preference Inventory (VPI) (Holland, 1978a) and the Self Directed Search (SDS) (Holland, 1979). Holland (1973, p. 19) has suggested that the SDS is the instrument of choice for measuring his personality constructs. Despite differences in format, the SDS and the VPI generally have

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very similar factor structures (Edwards and Whitney, 1972; Holland, 1978a), and the VPI has the advantage of taking less time to complete. However, neither version is suitable for easy inclusion in studies in which assessment of occupational personality type is only one part of the research focus. Moreover, as L. Gottfredson (1980) has noted, Holland's schema has rarely been used outside vocational counseling and research, despite its widespread potential applicability. Such work would be greatly facilitated by having a brief measuring device which retains the reliability and validity characteristics of the longer forms.

Little known to the professional literature are two short forms of the Vocational Preference Inventory, which were developed in the process of examining whether Holland's instrumentation was biased on the basis of sex (Holland, 1980). These scales, called Form A and Form B of the VPI, were developed as part of the VPI's seventh revision which attempted, among other things, to minimize instrument-dependent sex differences in responses to the occupational titles included in the scales (Gottfredson, Holland, and Holland, 1978). These forms have the advantage of being very brief (five minutes or less to complete) and, therefore, of encouraging more widespread usage in the research setting, if one may assume that reliability and validity are not compromised. Unfortunately, no formal publication of the psychometric properties of the VPI short forms has yet appeared in the literature. The purpose of this article was to present an empirical assessment of the test characteristics of one of these two VPI short forms, Form B, with particular reference to its factorial validity and criterion-related validity.

In its complete version, Form B of the VPI consists of seven items for each of the six Holland "clinical" scales (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). These items, which also compose one half of the "Occupations" items of the 1979 revision of the Self Directed Search (Holland, 1979), in turn were obtained from the Seventh Revision of the Vocational Preference Inventory (Gottfredson, Holland, and Holland, 1978). Space limitations in a questionnaire in which the instrument was included necessitated cutting two items, as discussed subsequently—a step resulting in a form composed of 30 items in comparison with a set of 160 items on the complete VPI and a total of over 228 items on the complete SDS. Thus, should this shortened version prove to be empirically reliable and valid, it would have considerable promise for expanding vocational preference measures to presently underresearched areas, e.g., to measuring the fit between persons and their work or family environments.

Method

Subjects

As participants in a larger study of the effects of a major policy reform in the United States Government, employees in five federal organizations were asked to complete a revision of Form B of the VPI. These organizations, which were intentionally chosen to represent diversity of function and technology, included an engineering/technical oriented production facility, a hospital, a housing benefits office, segments of the headquarters of a large regulatory agency, and a forms processing unit. The total sample size was 2822, with response rates at the individual organizations ranging from approximately 80% to about 94%. In each of the five sites employees held positions at all organizational levels and in a variety of vocations, from unskilled to professional.

Instrument

Form B of the VPI was employed. Sample items are presented in Table 1. The complete 42-item instrument was further reduced to enable the form to fit easily on one page. Using analyses based on pre-testing (N = 140), the investigators eliminated two items with the lowest item-scale intercorrelations from each of the six a priori scales. Hence a 30-item form resulted. Four additional items were added in an attempt to achieve an improved balance in the scales. Specifically, higher job level items (Machinist and Certified Public Accountant) were added to the Realistic and Conventional scales, a lower level item (Medical Technologist) to the Investigative scale, and a nonmusically related item (Artist) to the Artistic scale. Three of these four added items were taken from Form A of the VPI, the alternative short form.

Procedure

The revised short Form B of the VPI was included as part of a longer questionnaire used to evaluate organizational characteristics

TABLE 1
Sample Items, VPI Form B

Tree Surgeon	Youth Camp Director
Surveyor	Vocational Counselor
Chemist	Publicity Director
Astronomer	Restaurant Manager
Composer	Bank Teller
Musician	Payroll Clerk

relevant to the major purposes of the study. Factor analyses were performed using the VPI Form B items for the overall sample, for subsamples in each of the five organizations, and separately for subsamples of men and women. Correlations among the scales were also computed for the overall sample and for subsamples associated with each site and sex. Measures of internal consistency (coefficient alphas), means, and standard deviations were likewise calculated (i.e., for the entire sample and for subsamples by organization and by sex). Finally, VPI high point profiles were determined for criterion groups and compared to the job preference profiles established by Holland's Occupational Finders (Holland, 1979; 1978b).

Evidence for the construct validity of the VPI short form would thus consist of a factor solution with the items from each a priori scale loading most highly on its respective (intended) scales, with correlations among the six scales falling at moderate levels, with higher correlations between adjacent scales than between nonadjacent scales (Holland, 1973, p. 23), and with moderate to high measures of internal consistency for each scale. The means for the various scales should follow a differential pattern for men and women according to extensive research evaluating sex differences in vocational preferences (e.g., Hansen, 1981). Specifically, men would be expected to score higher than women on the Realistic, Investigative, and Enterprising scales; and women higher than men on the Social, Artistic, and Conventional scales (Holland, 1979, p. 53). Finally, the VPI Short Form B should result in high point occupational preference patterns similar to those found by using the long form VPI or the Self Directed Search. Using the standard VPI scoring procedures (Holland, 1978a), the investigators obtained scores for each scale on Form B by adding the number of "Yes" endorsements (i.e., respondent finding this occupation interesting or appealing) for each scale. Eliminated from the sample were those subjects who had left the form blank (n = 44), those who had put "Undecided" or "No" for all items (n = 102), persons who had exhibited 24 or more missing data points (n = 35), and those who had endorsed 27 or more items "Yes" (n = 20). These exclusions were made to eliminate subjects whose completion of the instrument indicated probable response bias (Holland, 1978a, p. 8). A final sample of 2621 resulted.

Based on preliminary analyses, the four added items (Artist, Certified Public Accountant, Machinist, and Medical Laboratory Technician) all performed more effectively than items included in the original version of Form B. Substituted for items with lower factor loadings on the relevant scales, these four items replaced the

following items respectively: Free Lance Writer, Inventory Controller, Fish and Wildlife Specialist, and Zoologist. For all subsequent analyses to be reported, results are based on this revised Form B of the VPI.

Results

Factor Analyses

Table 2 presents evidence of the factorial validity of the VPI Short Form in terms of all respondents grouped together. Six factors emerged from these data. Each empirical factor was readily interpretable in terms of the six a priori Holland scales. The only exception to this otherwise very "clean" solution was the fact that two items on the Enterprising scale (Publicity Director and TV Producer) were loaded more highly on the Social and Artistic scales, respectively, than on the scales for which they were intended. These loadings were probably a function of the nature of these particular items, as Publicity Directors have a decidely Social component to their jobs and as similarly an Artistic component exists in the job of TV Producer. Since both of these items were also reasonably strongly associated with the Enterprising scale, their loadings on other scales did not constitute a serious threat to scale validity.

The same factor analytic procedures were repeated for each of the subsamples from the five organizations in the study and for the two subsamples corresponding to sex. Since all these analyses resulted in essentially the same factor solution as reported in Table 2, they are not reported.

Interscale Correlations

Pearson product-moment correlation coefficients between scores on all pairs of scales are presented in Table 3. In general, the relationships among the scales are as the theory predicts, with adjacent scales being more highly correlated with each other than with non-adjacent scales, and with diagonally opposite scales in Holland's (1973) hexagonal model being least correlated with one another. There are two exceptions to this general finding: first, the Conventional and Realistic scales were not correlated so highly as would be predicted by the model. However, this phenomenon, which has been noted in other samples (e.g., Tuck and Keeling, 1980) and may represent a deficiency of the theory rather than one of the instrument. Second, the Artistic scale was correlated about

TABLE 2
VPI Short Form Varimax Rotated Factor Loadings[a]

Variable	Communality	Factor (1)	(2)	(3)	(4)	(5)	(6)
Realistic Item No. 1	19	06	−08	16	02	*39*	03
Realistic Item No. 2	28	02	04	31	03	*43*	03
Realistic Item No. 3	51	−04	−05	04	−01	*71*	04
Realistic Item No. 4	46	−02	01	19	−05	*65*	00
Realistic Item No. 5	23	−02	10	−02	06	*46*	07
Investigative Item No. 1	42	13	05	*61*	01	17	01
Investigative Item No. 2	35	28	−09	*48*	01	19	01
Investigative Item No. 3	68	17	−08	*79*	03	08	00
Investigative Item No. 4	58	11	−06	*74*	04	11	00
Investigative Item No. 5	26	09	26	*40*	11	10	00
Artistic Item No. 1	37	*56*	−05	22	10	03	07
Artistic Item No. 2	62	*77*	−07	10	11	00	−01
Artistic Item No. 3	55	*73*	03	06	08	03	02
Artistic Item No. 4	65	*79*	03	04	14	01	04
Artistic Item No. 5	54	*71*	−09	12	14	−02	01
Social Item No. 1	25	06	06	−03	*48*	08	05
Social Item No. 2	40	13	07	01	*61*	−00	04
Social Item No. 3	28	12	−01	17	*49*	03	−01
Social Item No. 4	36	08	06	05	*58*	04	12
Social Item No. 5	38	−01	16	04	*58*	−03	11
Enterprising Item No. 1	31	12	01	04	*49*	−09	23
Enterprising Item No. 2	51	07	06	−02	15	10	*69*
Enterprising Item No. 3	27	*30*	01	14	30	−03	27
Enterprising Item No. 4	50	00	15	−03	30	10	*62*
Enterprising Item No. 5	26	03	30	05	27	07	*30*
Conventional Item No. 1	26	−01	*58*	09	05	02	09
Conventional Item No. 2	58	−03	*76*	−07	04	00	−01
Conventional Item No. 3	51	−01	*70*	−09	09	−01	04
Conventional Item No. 4	30	−12	*47*	02	23	02	12
Conventional Item No. 5	61	−06	*78*	−04	−02	−01	01
Cumulative Percentage of Variance		9.6	18.0	25.8	32.8	38.2	42.0

Note.—Decimal points are omitted from communalities and factor loadings. The italacized entries are the highest scale loadings for that item.
[a] n = 2177; pair wise deletion used for missing data.

TABLE 3
Correlations among the VPI Short Form Scales

Variable	R	I	A	S	E	C
Realistic (R)						
Investigative (I)	34 (2620)					
Artistic (A)	05 (2618)	32 (2619)				
Social (S)	06 (2620)	14 (2621)	24 (2619)			
Enterprising (E)	09 (2620)	13 (2621)	25 (2619)	46 (2621)		
Conventional (C)	01 (2618)	−01 (2619)	−07 (2617)	19 (2619)	23 (2619)	

Note.—Decimal points are omitted from the correlation coefficients. Sample sizes for each correlation are indicated in parentheses below the entry.

equally with the Social and the Enterprising scales, although theoretically it would be anticipated to be more highly correlated with the Social than with the Enterprising scale. This finding is probably associated with the ambiguity of the Enterprising scale on Items 1 and 3, as discussed previously.

The correlational analyses were repeated for subsamples by organization and by sex. In the instance of organization, substantially the same patterns were obtained as reported for the overall sample. Although the correlations for each sex also followed the same general pattern suggested by the theory, the Realistic scale correlated less highly than expected with the Conventional scale for the female subsample. Also, the correlation between the Enterprising and the Conventional scales for women, but not for men, was somewhat lower than would be expected.

Reliabilities

The internal consistency, or reliability (coefficient alpha) analyses are displayed in Table 4. These results generally show what would be considered acceptably high internal consistency, particularly in terms of the small number of items (five) for each scale in relation to 14 items for corresponding scales in earlier studies (e.g., Holland, 1978a). The lowest reliabilities were observed for the Realistic and Enterprising scales. The relatively lower reliabilities of Enterprising scales were not surprising, for reasons already discussed. The relatively small Realistic scale alphas were perhaps associated with the restriction in range noted in subsamples corresponding to several of the organizations in this study. Despite these shortcom-

TABLE 4
VPI Short Form Scale Internal Consistencies (Coefficient Alpha)

Sample	Scale					
	R	I	A	S	E	C
Engineering/technical facility	64	77	82	73	65	76
Hospital	67	76	84	71	66	78
Housing benefits office	63	76	85	71	65	75
Regulatory agency headquarters	62	75	84	70	64	74
Forms processing unit	58	76	84	65	65	78
Male	57	75	83	67	65	79
Female	65	78	85	73	65	71
Total Sample	66	76	84	70	65	78

Nore.—Decimal points are omitted from the alpha coefficients. R = realistic, I = investigative, A = artistic, S = social, E = enterprising, and C = conventional.

ings, both the Realistic and the Enterprising scales were judged sufficiently high to warrant continued use and development of the instrument.

Normative Data

Table 5 summarizes the mean number of item endorsements and the standard deviations for the scales for subsamples relative to each of the five organizations studied and relative to each sex, as well as for the overall sample. First, it is noteworthy that differences appeared at the organizational level when scales were aggregated across the respondents in each research site. These differences seemed to follow a theme consistent with the dominant technology of each unit. For example, Investigative, Realistic, and Enterprising were the high point scales for the Engineering/technical facility. Second, the sex difference in mean endorsement patterns for the various scales reflected the pattern of findings that had been suggested by Holland (1979) and others (e.g., Hansen, 1981). Specifically, men score higher than women on Realistic and Investigative scales, and women higher than men on the Artistic, Social, and Conventional scales (Holland, 1979, p. 53). The one exception was the Enterprising scale, on which women had a slightly higher mean score than did men. This outcome might reflect some artifact of women in government, as traditionally women have had more managerial advancement opportunities than they have had in the private sector. An alternative explanation is the previously discussed scale construction difficulty for this scale.

TABLE 5
Normative Data for the Revised VPI Form B

Sample	Scale												
	R		I		A		S		E		C		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	n^a
Engineering/technical facility	1.82	1.45	2.42	1.78	1.55	1.73	1.57	1.59	1.90	1.53	1.18	1.49	544
Hospital	.92	1.25	2.14	1.76	2.21	1.89	1.75	1.58	1.73	1.52	1.03	1.45	523
Housing benefits office	.89	1.77	1.95	1.73	2.37	1.94	2.04	1.66	2.10	1.56	1.33	1.52	450
Regulatory agency	.84	1.16	1.99	1.68	2.34	1.93	1.89	1.60	2.25	1.57	1.27	1.44	351
Forms processing unit	.73	1.04	1.94	1.71	1.81	1.82	1.85	1.53	2.16	1.56	2.27	1.78	753
Female	.63	.98	1.93	1.71	2.06	1.86	1.96	1.57	2.12	1.55	1.95	1.77	1435[a]
Male	1.54	1.42	2.32	1.77	1.93	1.89	1.63	1.61	1.91	1.55	.96	1.29	1177[a]
Total Sample	1.02	1.30	2.05	1.77	1.95	1.89	1.76	1.62	1.96	1.59	1.47	1.66	2621

Note.—R = realistic, I = investigative, A = artistic, S = social, E = enterprising, and C = conventional. The findings are based on a 30-item scale, as explained in the text.
[a] The totals for males and females do not agree with sample total, as some respondents did not indicate their sex.

Criterion Group Scale Profiles

The final validation evidence to be presented that was intended to provide some indication of criterion-related validity pertained to the high point scores for representative occupational groups included in the study. Using the job classification system of the Government (United States Government, 1958), the investigators first grouped together employees with similar positions, i.e., those with the same job classification code. Next, as shown in Table 6, several groups of positions were selected for which well established Holland high point scores could be identified from the criterion measure, Holland's Occupations Finder (Holland, 1978b, 1979). A problem encountered in conducting these analyses was the fact that many positions in the Government's job classification system did not have obvious equivalents in Holland's Occupations Finder.

High point scores computed from Holland's VPI Short Form B were obtained for the selected occupations and the resulting scores were compared with the high point score profiles for the same occupation as presented in Holland's job listings. These results, summarized in Table 6, were generally supportive of the criterion-related validity of Form B, although in several cases, the ordering of the letters of the incumbents responding to Form B differed from the ordering that the Occupations Finder suggested. It must also be noted that little research has been completed to demonstrate whether the work of persons performing these occupations differs in and out of Government settings. It is possible that for some jobs the occupational preferences of incumbents may differ because different types of people may be attracted to private sector in contrast to governmental settings. In general, however, the degree of agreement between the criterion and the actual preferences of members in the current samples was fairly strong.

It should finally be recorded that few respondents in this large set of samples reported any problems with the instrument or indicated completion of the scales to be offensive, even though the form was used strictly in a research context, with no individualized feedback provided. This observation is significant because the choice among empirical tests of personality for "real life" settings is often limited by the consideration that research participants may find the instruments or techniques employed to be overly intrusive or otherwise distasteful to complete. Such did not appear to be the case with this measure.

TABLE 6
High Point Holland Scale Profiles for Selected Occupational Groups

OPM Position Series Code[a]	Job Series Title	*n*	Expected Profile[b]	VPI-B Profile[b]
Realistic Occupations				
856	Electronics Technician Series	19	RIE	IRE
1670	Equipment Specialist Series	12	RIE	RIE
2614	Electronics Mechanic	10	RIE	IRE
3359	Instrument Mechanic	191	RCI	IRE
4742	Utility Systems Repair	5	RIS	RI*AC*
Investigative Occupations				
110	Economist Series	11	IAS	IAS
180	Psychology Series	8	ISA	IAS
332	Computer Operations Series	31	ICR	ICA
644	Medical Technologist Series	14	ISA	IAE
661	Pharmacy Technician Series	8	IES	IEA
Artistic Occupations[c]				
Social Occupations				
185	Social Work Series	12	SIA	SAE
212	Personnel Staffing Series	30	SEC	SEA
235	Employee Development Series	15	SEI	SEA
621	Nursing Assistant Series	84	SAI	AIS
Enterprising Occupations				
201	Personnel Management Series	21	ESC	ESA
905	General Attorney Series	16	ESA	AEI
340	Program Management Series	32	ESC	EAS
160	Civil Rights Analysis Series	28	ESI	SAE
Conventional Occupations				
312	Clerk Stenographer and Reporter Series	9	CES	CES
322	Clerk-Typist Series	128	CSE	CAE
356	Data Transcriber Series	89	CER	CEI
501	General Accounting Clerical and Administrative Series	28	CES	CES
592	Tax Accounting Series	279	CES	CES

[a] The Office of Personnel Management job codes are taken from the United States Government (1958).
[b] R = Realistic; I = Investigative; A = Artisitc; S = Social; E = Enterprising; C = Conventional
[c] No occupations with sample sizes ≥ 5 had expected Holland profiles in the Artistic group.

Discussion

The previously reported results, overall, were quite supportive of the research utility of Form B of the VPI, as revised in this study. Furthermore, indirect support for the validity of Holland's basic constructs and theories has been provided by the fact that this 30-item form has demonstrated basically the same scaling characteristics as have far longer instruments with much more extensive validation literature. In short, the factorial validity of the VPI Form

B in terms of the correspondence of empirical dimensions with *a priori* scales was clearly demonstrated. Moreover, criterion-related validity received considerable support in terms of matching obtained profiles of high scores with those already established for longer scales.

A few issues will need further study. First, the Enterprising scale, as presently measured, is not nearly so "pure" as would be desirable. Two of its five items were loaded more highly on scales other than Enterprising. Although this occurrence does not pose a major threat to the validity of the scale, alternative constructions of the form should be investigated, including the one on Holland's Form A of the VPI. Second, the reliabilities of at least two of the scales (Realistic and Enterprising), although judged to be acceptable, could be improved. Third, investigators should compare this version of the VPI (and the 42-item form) with the complete SDS and VPI. Finally, users of the VPI Form B should be cautioned that this form of Holland's instrument was not designed for individual or group counseling purposes, but rather for research explorations. Vocational counselors should continue to use traditional measures of occupational preference designed and validated for individual interpretation until appropriate validation studies are performed which would support its use for counseling purposes.

Given these precautions, the VPI Short Form B can have many applications in settings which to date have received inadequate study. The concept of environment, for example, still needs much more attention, and the VPI Form B is well suited for such research. Additionally, more studies are needed expanding Holland's concept to organizational settings, in a manner to encompass such variables as job satisfaction or turnover of persons of various occupational personality types. Some work has been reported in this area (e.g., Mount and Muchinsky, 1978; Schmitt and White, 1978; Smart, 1975), although frequently in work settings it is only possible to include a very brief measure of personality, if any. The present study should help facilitate research in these and other areas. Such investigations would go far in helping psychologists to develop viable theories of personality that are work-pertinent and organizationally relevant and which are measurable in an efficient, yet inoffensive, manner.

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