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Holland-style Measures of Congruence: Are Complex Indices More Effective Predictors of Satisfaction?

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We explored the hypothesis that the greater the calculation complexity of a congruence index, the greater the likelihood that the index's scores predict level of job satisfaction. Five Holland-style congruence indices were computed for nine female and seven male occupational samples representing the six Holland types for each gender. Analyses for 12 samples did not identify any significant correlations between satisfaction and congruence. For the remaining four occupations and the composite data set, one to three congruence measures correlated significantly with satisfaction. Results indicated a very small relationship between congruence and satisfaction in these samples, which rendered immaterial comparisons of the efficacy of the congruence indices to predict satisfaction. Possible reasons for the small congruence–satisfaction correlations and other factors influencing satisfaction are discussed.

Many factors have been hypothesized to contribute to vocational satisfaction including congruence between a person's vocational interests and occupational environment. One of the most prominent of the person–environment fit theories is Holland's (1973, 1985, 1997) theory of vocational personality and career choice. Specifically, Holland's theory predicts that "vocational satisfaction, stability, and achievement depend on the congruence between one's personality and the environment in which one works" (Holland, 1985, p. 10). While vocational counseling largely relies on the assumed veracity of this hypothesis, reviews and meta-analyses of the congruence–satisfaction literature provide mixed support for Holland's congruence construct.

Spokane (1985), for example, reviewed 63 studies on person–environment congruence as related to a range of factors and concluded "on balance, congruence is associated with performance, satisfaction and stability" (p. 329). Conversely, Assouline and Meir (1987) conducted a meta-analysis on the congruence literature incorporating 21 studies that specifically examined the congruence–satisfaction hypothesis and concluded there was little or no relation between congruence and satisfaction. More recently, Tranberg, Slane, and Ekeberg (1993) conducted a meta-analysis specifically examining only the congruence–

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satisfaction hypothesis. Congruence was positively correlated with satisfaction in 17 of the 27 studies identified in their search. However, the overall mean correlation between congruence and satisfaction, based on the 22 studies for which calculations were possible, was nonsignificant. Thus, a clear consensus regarding the congruence–satisfaction hypothesis does not exist.

Researchers have suggested that conflicting results may be due to the variety of congruence measures in use and the ensuing lack of consensus regarding the most appropriate measure of congruence (e.g., Brown & Gore, 1994; Camp & Chartrand, 1992; Spokane, 1985). Additionally, the lack of sophistication of congruence measures may have limited the usefulness of many research findings (Tranberg et al., 1993). Holland's most recent explication of congruence (Holland, 1997) calls for research in this area to use (a) several congruence indices, (b) better assessments of occupational environments, (c) larger samples, (d) samples of women and men in each occupation, (e) well-established scales and inventories, (f) occupational samples that represent the six basic Holland types, and (g) theory-driven hypotheses. The design and methodology of this study are consistent with all of Holland's research recommendations with the exception of one. Namely, occupational environment types were based on average interest scores of persons who shared an occupational title rather than on individuals' actual job descriptions.

The over-arching hypothesis for this study was that congruence measures differ in their ability to distinguish between samples of satisfied and nonsatisfied workers. Furthermore, congruence measures that require complex calculation formulas were expected to be the best predictors of job satisfaction.

Measures of congruence can be divided into two categories: those that incorporate some or all of Holland's theory of vocational types and the accompanying calculus assumption, and those that do not. Those congruence indices that incorporate Holland's theory into the scoring algorithm require that the interests of the person and the characteristics of the environment be represented by Holland's six vocational types—Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). Further, the calculus assumption of Holland's theory suggests that the relationship between the six vocational types can be described by an hexagonal model in which the types are placed in an R-I-A-S-E-C order on the points of a hexagon. Those types that are closer to each other on the hexagon are considered more similar to one another (Holland, 1973, 1985, 1997). Generic measures of congruence often differ from Holland congruence measures in that they do not incorporate the relationships described by Holland's hexagon into the congruence index computation.

This study was limited to the five congruence indices that use measures of Holland's six types to operationalize interests and environments and that also incorporate either Holland's calculus construct or the hexagon's underlying dimensions into the calculation of the index. The most complex and sophisticated congruence measures in this study were defined as those that (a) allowed differing numbers of salient codes for the particular person and environment or

used all scale scores for all six types, (b) used actual scale scores instead of rank orderings of the scores, (c) had a large number of possible scores, (d) had a greater degree of symmetry in their possible score distributions, and (e) incorporated the order of the person codes and the environment codes in the calculation of the measure.

The least complex index used in this study was First-letter Hexagonal Distance (FL-Hex; Holland, 1973). FL-Hex uses the highest ranking scale for the person and the environment for congruence calculations. The second measure, the K–P index (Kwak & Pulvino, 1982), uses the three highest scale scores rank ordered for both the person and the environment and incorporates the empirical correlations between all pairs of the six vocational types of Holland's hexagon. The third measure, the Hexagon Congruence Index (HCI; Swaney & Prediger, 1985; Prediger & Vansickle, 1992), uses actual scale scores and is the only measure to directly incorporate the hexagon's underlying dimensions. Congruence scores are based on the angle of difference between one's interests and one's environment in the two-dimensional ideas/data, people/things space.

The fourth measure, the Sb index (Gati, 1985), is based on the hexagon model and is the only measure in this study that allows the person and environment to have differing numbers of salient codes. Calculation of this index is based on a complex equation that compares the shared and unshared salient codes between the person and environment.

Finally, the fifth measure, the C index (Brown & Gore, 1994), is based on the hexagonal model and uses rank-ordered scores. This measure uses the three most salient codes for both the person and the environment and allows 19 possible scores resulting in a symmetrical and approximately normal possible score distribution.

Weighing each of the elements described above that contribute to the complexity of the various indices, it was predicted that the Hexagon Congruence Index (HCI), the most complex index, would distinguish between groups of satisfied and nonsatisfied workers better than would the C index. The C index in turn would distinguish between groups of satisfied and nonsatisfied workers better than would Sb and K–P. Finally, Sb and K–P would distinguish between workers better than First-letter Hexagonal Distance (FL-Hex). (See Table 1 for a summary of the five measures with respect to these characteristics.)

METHOD

Participants

The research samples consisted of satisfied and nonsatisfied participants from 16 occupational samples collected for the 1985 revision of the Strong Interest Inventory (Hansen & Campbell, 1985). One of the first steps in constructing an Occupational Scale for the Strong is to collect samples of women and men employed in the occupation of interest. Individuals were invited to participate in the SII revision project through the mail. The participants received one follow-up

TABLE 1
Congruence Measure Values for Various Measure Attributes

	Attribute				
Measure	Salient codes	R-O vs Actual scores	Possible scores	Distribution shape	Use of order
FL-Hex	1	R-O	4	Symmetrical[a]	N/A
K–P	3	R-O	>500[a,b]	Skewed	Yes[a]
HCI	6[a]	Actual[a]	∞[a]	Skewed	Indirectly[a]
Sb	Varies[a]	R-O	64[a]	Skewed	No
C	3	R-O	19[a]	Symmetrical[a]	Yes[a]

Note. FL-Hex = First-letter Hexagonal Distance; K–P = K–P index; HCI = Hexagon Congruence Index; Sb = Sb index; C = C index.

[a] These values reflect more complex options within each attribute for computing congruence measures.

[b] This value varies by gender and by source of R-I-A-S-E-C intercorrelations. This is a conservative estimate.

reminder. No financial incentives or rewards were given for participation. The return rate varied slightly from occupation to occupation but averaged about 45%. All participants used in this study, satisfied and nonsatisfied, had been in their occupation for at least three years, had the educational and training background typical for the occupation, and performed their work in a manner typical of the occupation.

All individuals who participated in the l985 revision were asked to complete the Strong and a four-response question assessing their satisfaction with their occupation (i.e., very satisfied, like, indifferent or dislike). A recent study by Wanous, Reichers, and Hudy (1997), comparing single-item measures of job satisfaction to scale measures of the same construct, suggests that for a sufficiently unambiguous construct such as job satisfaction, a single-item measure can be acceptable. Their results indicate that estimates of the minimum reliability of single-item measures of job satisfaction approach .70.

Participants in Strong Interest Inventory scale construction research, who indicate that they are “very satisfied with” or “like” their occupation, are retained for use in the criterion samples used in scale construction. Those individuals who indicate that they are “indifferent about” or “dislike” the occupation are excluded from scale construction. Although most people who participated in the 1985 revision of the Strong indicated that they were satisfied with their occupation, every sample collection effort included some individuals who were “indifferent about” or “dissatisfied” with their occupation. The availability of these indifferent and dissatisfied participants provides the unique opportunity to examine the relationship between congruence and satisfaction for a large number of occupations that vary in occupational status and educational level and that represent the six Holland types. In addition, within each occupation, the satisfied and nonsat-

isfied participants were collected under the same conditions and from the same population pool.

Occupations were identified that had comparatively large numbers of nonsatisfied workers for possible inclusion in this study. Occupations were selected from this pool such that each of the six Holland themes was represented for each gender by at least one occupation. In addition, when an occupation was chosen for one gender, it also was chosen for the other gender when sample size permitted. Further, efforts were made to select occupations that reflected the widest range of educational requirements and status levels while maintaining sample size.

Using the above selection guidelines, seven occupations were included for both genders in this study: Navy enlisted personnel, medical technologist, English teacher, social science teacher, optician, Air Force enlisted personnel, and mathematics teacher. Two occupations were included for females only—dental hygienist and secretary—based on their large contingents of nonsatisfied workers. Adequate numbers of male workers were not available for these two occupations.

For this study, the SII criterion sample for each occupation was divided into two subsamples. The first sample (Satisfied Sample 1; $N = 60$) was randomly drawn from the total sample and then combined with each occupation's nonsatisfied sample to be used in the point biserial correlational study. The remainder of each occupation's SII criterion sample (Satisfied Sample 2) was used to determine the occupation's Holland code which is a necessary step in calculating congruence index scores.

Table 2 is organized by occupation within gender and summarizes Holland code, sample size and mean years of education, occupational experience, and age for both the Satisfied Sample 1 and the nonsatisfied sample of each occupation.

Measures

Vocational interest types. Vocational interest type was based on each individual's scores on the six 1985 General Occupational Themes (GOTs) of the Strong. Each GOT is a 20-item, rationally constructed scale corresponding to one of Holland's six vocational types. Each item has a three-choice response format typically including "like," "indifferent," and "dislike." Same-sex normed scores for each GOT were based on a sample of women-in-general ($N = 300$) or men-in-general ($N = 300$) with the mean set equal to 50 and a standard deviation of 10. Thus, depending on the specifications of each congruence measure, either the actual scores or the rank ordering of the six GOTs from the individual's vocational interest type were used to calculate the five congruence indices.

Occupational environment type. The values for the six Holland codes representing the environment of a given occupation were generated by calculating the mean score for each GOT for Satisfied Sample 2 for each occupation. This closely resembles the method for determining work environment codes recommended by Lent and Lopez (1996). As with the individual vocational interest

TABLE 2
Summary Information for Female and Male Occupational Samples

Sample	Females								Males							
	Holland code	n	Education		Experience		Age		Holland code	n	Education		Experience		Age	
			M	SD	M	SD	M	SD			M	SD	M	SD	M	SD
Air Force enlistee	CRS								RCS							
Satisfied		60	13.5	1.6	10.9	5.3	32.1	5.4		60	13.2	1.5	12.1	5.9	33.6	7.1
Nonsatisfied		24	13.1	1.6	7.0	3.4	29.0	3.2		31	13.0	1.5	11.5	6.0	31.9	5.3
Dental hygienist	SCI															
Satisfied		60	15.8	1.4	8.1	4.5	30.5	5.8				Not available				
Nonsatisfied		34	16.2	1.5	10.3	7.4	33.7	7.6				Not available				
English teacher	ASE								ASI							
Satisfied		60	17.8	1.6	13.7	6.8	38.4	7.3		60	18.2	1.6	15.4	6.1	38.6	6.2
Nonsatisfied		24	18.5	2.0	15.0	5.9	41.7	7.7		24	18.1	1.4	12.7	5.8	37.2	6.4
Mathematics teacher	CIR								CIR							
Satisfied		60	17.6	1.6	11.8	5.5	37.3	7.3		60	18.0	1.2	15.7	7.3	40.8	7.2
Nonsatisfied		19	17.1	1.1	11.8	5.9	36.9	7.7		26	18.0	1.5	17.3	6.8	41.2	8.1
Medical technologist	ICR								IRC							
Satisfied		60	17.3	1.2	10.8	4.9	34.2	5.1		60	17.1	1.3	12.6*	7.4	36.7*	6.3
Nonsatisfied		40	17.3	1.1	13.7	7.1	37.3	7.4		45	17.3	1.6	8.6*	4.5	32.9*	4.7
Navy enlistee	RCS								RCS							
Satisfied		60	12.9	1.1	7.3	3.1	29.2	3.0		60	13.2	1.9	11.3	5.1	31.2	4.6
Nonsatisfied		55	13.2	1.5	6.3	2.6	29.7	3.5		48	13.3	2.5	11.0	5.4	32.6	5.3
Optician	ECR								ERI							
Satisfied		60	13.7	2.0	11.9	6.7	37.5	9.3		60	14.1	1.8	16.4	9.3	38.1	8.7
Nonsatisfied		23	14.4	2.4	9.0	5.3	32.6	7.1		28	14.6	2.2	13.7	8.8	35.9	8.1
Secretary	CES															
Satisfied		60	13.1	1.4	17.0	7.9	40.7	8.2				Not available				
Nonsatisfied		53	13.6	1.5	16.2	8.0	39.4	8.6				Not available				
Social science teacher	SCA								SCA							
Satisfied		60	17.8	1.6	12.1	5.5	39.5	7.7		60	18.1	1.5	15.0	5.9	39.2	6.4
Nonsatisfied		21	18.4	2.4	13.8	5.4	39.1	6.7		18	17.7	1.4	13.3	6.7	38.9	9.4

Note. All means and standard deviations are given in years.

types, depending on the congruence measure, either the actual mean scores or the rank order of the means of the GOTs were used for congruence measure calculations.

Congruence measures. Calculations for each of the five congruence indices (FL-Hex, K–P, HCI, Sb, and C) are described in earlier publications. The interested reader is invited to review the original publications, cited in the introduction, for a thorough explanation of the calculation used to compute scores for each index in this study.

In the case of the Sb index, however, Gati (1985) did not clearly state how the salient codes were to be determined for either the person or the environment. Therefore, an algorithm was created for this study to automate the selection of the salient codes for individuals and environments. In all cases, at least the highest code was considered salient. In addition, each proceeding code also was deemed salient if its actual score was within one-fifth of the entire range of the six GOT scores from the next higher code score. That is, when working from highest ranking code toward lowest ranking code, as soon as the distance between two codes was greater than one-fifth of the range of codes for that profile, no further salient codes were included. Thus, a person with GOT scores R = 35, I = 40, A = 65, S = 56, E = 61, C = 51, has the salient codes, in order, of AESC (one-fifth of the range = 6.0 = 1/5[65–35]). For further information regarding the calculation of this computationally complex measure, see Gati (1985).

Procedure

The five congruence measures were calculated for all participants using code written by the first author for SPSS 6.1 for Windows. Point biserial correlations between each of the five congruence measures and the dichotomous satisfaction designation were calculated a) for the composite occupational data set (N = 1473) and b) for each of the 16 occupational samples.

RESULTS

Each of the 16 samples were compared across levels of satisfaction for significant differences in years of education, years of occupational experience, and age. Due to the number of comparisons, the significance level was set at .01 to control Type I error. One occupation, male medical technologist, had a significant difference between the satisfied and nonsatisfied samples for mean years of experience (M = 10.8, 13.4; SD = 4.9, 7.2, respectively, p = .002) and for mean age (M = 34.2, 37.3 and SD = 5.1, 7.4, respectively, p = .002). This combination of significant differences is not surprising given the large expected correlation between age and years of occupational experience. (The correlation between age and years of experience for the composite sample composed of occupations in this study is r = .79, p = .0005.)

No additional statistically significant differences were found between any of the other 15 satisfied and nonsatisfied occupational samples for years of

TABLE 3
Point Biserial Correlations between Congruence and Satisfaction for the Composite Occupational Sample

Sample	FL-Hex	K–P	HCI	Sb	C
Female and Male Composite sample	.04	.07*	.09**	.05	.05

* $p < .01$.
** $p < .001$.

education, years of experience, or age. Similarly, there were no significant differences between the satisfied ($N = 960$) and nonsatisfied ($N = 513$) samples from the composite data set for these three variables. These findings suggest that, with the possible exception of male medical technologists, any differences between the satisfied and nonsatisfied samples, in terms of satisfaction, are due largely to factors other than educational level, years of occupational experience and age.

Composite Sample Results

Due to the number of comparisons made, the significance level was set at .01 to control for Type I errors. Based on the unidirectional nature of the hypothesis, one-tailed significance tests were performed on the point biserial correlations. Two of the five correlations between satisfaction level of the composite sample and congruence indices reached significance at the .01 level. Specifically, small but statistically significant relationships between satisfaction and congruence were revealed for the K–P index ($r = .07$, $p = .005$) and HCI ($r = .08$, $p = .001$). The operationalization of congruence by Fl-Hex, Sb, and C index failed to produce significant relationships with satisfaction. Results are presented in Table 3.

Intercorrelations among the five congruence indices, based on the composite sample, are reported in Table 4. These correlations are substantial with K–P and

TABLE 4
Intercorrelations between the Five Congruence Measures for the Composite Occupational Sample

	K–P	HCI	Sb	C
FL-Hex	.78	.53	.69	.82
K–P		.47	.61	.85
HCI			.56	.55
Sb				.61

Note. All correlations are significant at $p < .001$.

TABLE 5
Point Biserial Correlation between Congruence and Satisfaction for the Female and Male Occupational Samples

	Female					Male				
Sample	FL-Hex	K–P	HCI	Sb	C	FL-Hex	K–P	HCI	Sb	C
Air Force enlistee	−.08	−.01	.07	−.04	−.07	−.02	.10	−.04	−.04	.04
Dental hygienist	−.06	.01	−.02	−.04	−.09	Not available				
English teacher	.22	.18	.33**	.23	.29*	−.06	−.08	.04	−.10	−.03
Mathematics teacher	−.16	−.13	−.02	−.03	−.17	−.16	−.01	−.01	.04	−.01
Medical technologist	.01	.02	.09	.01	.02	−.10	−.01	.04	−.03	−.05
Navy enlistee	.10	.18	.24*	.18	.14	−.04	.01	.12	−.02	−.07
Optician	.12	.24	.17	.12	.19	.11	.18	.13	.18	.11
Secretary	.31**	.27*	.04	.20	.27*	Not available				
Social science teacher	.08	.18	.08	.08	.03	.29*	.15	.14	.20	.20

* $p < .01$.
** $p < .001$.

C showing the most shared variance and HCI generally sharing the least variance with the other four measures.

Individual Sample Results

In an effort to identify possible patterns and important findings within occupations, point biserial correlations also were performed for each occupational sample. For 12 of the 16 occupational samples, none of the congruence indices correlated significantly with satisfaction. For the remaining four samples, one to three congruence indices correlated significantly with level of satisfaction at the .01 level. These occupational samples were female Navy enlistee (HCI, $r = .24$, $p = .005$), female English teachers (HCI, $r = .33$, $p = .001$; C, $r = .29$, $p = .004$), female secretary (FL-Hex, $r = .31$, $p = .0005$; K–P, $r = .27$, $p = .002$; C, $r = .27$, $p = .002$), and male social science teacher (FL-Hex, $r = .29$, $p = .004$). Results are presented in Table 5.

No pattern of similarity was identified among the occupations for which a congruence index did predict satisfaction. For example, significant correlations were found for occupations at every educational level, experience level, age, and four of the six primary occupational Holland codes.

DISCUSSION

For both the overall sample and the individual samples, fewer significant correlations were found between congruence and job satisfaction than Holland's

congruence–satisfaction hypothesis would suggest. In addition, no pattern of findings emerged among the congruence measures within each sample that did have significant correlations. Given the minimal number of statistically significant results and their inconclusive pattern, formal comparisons among the levels of correlations were not conducted.

Only 9 of the 85 correlations computed between congruence and satisfaction were significant at the .01 level. Similarly, the significant correlations were found for only 4 of the 16 occupational samples and the composite sample. In addition, the two statistically significant correlations for the composite sample were quite small ($r = .08$ for HCI; $r = .07$ for K–P). These findings suggest that little variance in satisfaction in these samples was accounted for by congruence. Without the presence of at least a moderate congruence–satisfaction relationship throughout the samples, a comparison of the relative efficacy of congruence measures was deemed questionable.

The minimal congruence–satisfaction relationship found in this study is consistent with earlier research that used samples composed of persons in many different occupations. For example, Lent and Lopez (1996) tested three of the five congruence indices used in this study with two samples and found only two significant bivariate correlations between congruence and job satisfaction scores. Using an academic sample, Camp and Chartrand (1992) found no substantial correlations of congruence with relevant outcomes. The results of the present study, then, suggest to us that workers who remain in occupations for at least three years, as was the case with all participants in this study, generally have self-selected into occupations congruent with their interests and that their satisfaction after working in their occupations for some time is based on other factors not explored in this study.

Factors other than vocational interests that were not measured in this study, but that are hypothesized by various theories of work adjustment to have an impact on satisfaction, include compensation, comfort of the work environment, congeniality of co-workers, supervisory style and competence, opportunities for achievement, and advancement (Dawis & Lofquist, 1984; Williamson, 1965). Other satisfaction correlates also appear to include personality factors. For example, a recent study by Tokar and Subich (1997) found satisfaction correlated significantly with two of the five factor personality variables (neuroticism and extraversion), but not with measures of congruence (K–P and C indices). In sum, working in an interest-incongruent occupation may lead to dissatisfaction, but present results suggest that working in an interest-congruent occupation does not conversely guarantee satisfaction.

One possible limitation of this study was the necessity, because of the small number of “dislike” and “indifferent” participants, of treating these participants as if they felt the same intensity of dissatisfaction with their occupation. Another limitation relates to the small number of people in the Strong Interest Inventory scale construction samples who indicated that they were not satisfied with their work. The samples in this study reflect those Strong Interest Inventory criterion

samples that had the highest proportions of nonsatisfied individuals. Thus, the results for this subset of occupations from the 1985 Strong may not be representative of other occupations in which higher proportions of workers are satisfied.

SUMMARY

In conclusion, these results show a minimal overall congruence–satisfaction relationship that precluded examining the relative efficacy of the congruence measures to predict satisfaction. Although results such as these may call into question the veracity of the congruence–satisfaction hypothesis, another possible explanation is that workers with greater occupational tenure, such as comprised these samples, have largely self-selected into fairly congruent occupations leaving other factors accountable for their satisfaction. If this is the case, it would appear that the congruence–satisfaction relationship is an important factor largely for workers entering new fields or substantially changing their positions within fields rather than for more seasoned workers. In addition, these findings suggest that the application of the congruence–satisfaction hypothesis be explored in relation to tenure, and that further research incorporating the congruence–satisfaction hypothesis include participants who are new to their occupations.

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