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# The Structural Validity of Holland's R-I-A-S-E-C Model of Vocational Personality Types for Young Black South African Men and Women

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This study examined the validity of Holland's circular order model of vocational personality types for young black South African men and women. The validity of the model was investigated for four groups, namely men and women from the Eastern Cape Province, and men and women from the North West Province. The randomization test of hypothesized order relations and the accompanying correspondence index suggested that the data of all four groups fit the circular order model poorly. The results of multidimensional scaling analyses also suggested poor fit. These results indicate that the circular order model may not be valid for black South African youths. Reasons for the unsatisfactory fit between the model and the observed data are discussed.

**Keywords:** Vocational interests, cross-cultural, hexagonal model, vocational personality types, structure of vocational interest, circular order model

John L. Holland's (1973, 1985, 1997) structural model of vocational personality types has generated a substantive body of empirical research and academic debates (Borgen, 1991; Tinsley, 1992, 2000). The model has also led to the development of interest inventories, such as the Vocational Preference Inventory (Holland, 1985) and the Self-Directed Search (SDS; Holland,

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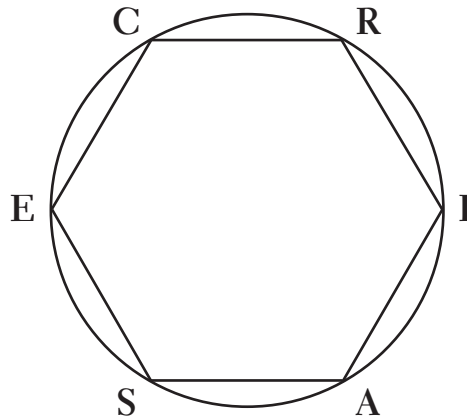


Figure 1. Holland's circular order model. R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

Fritzche, & Powell, 1994), that are widely used for career counseling purposes. Holland (1973, 1985, 1997) postulates the existence of six vocational personality or interest types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). This model can be spatially represented as a circular R-I-A-S-E-C ordering of the six types (see Figure 1). The circular ordering leads to a number of predictions about the relationships between the types. Specifically, the correlations among adjacent types (RI, IA, AS, SE, EC, and CR) are expected to be greater than the correlations among alternate type pairs (RA, IS, AE, SC, ER, and CI) and pairs of opposite types (RS, IE, and AS). The correlations among alternate type pairs (RA, IS, AE, SC, ER, and CI) are also expected to be greater than the correlations among pairs of opposite types (RS, IE, and AS) (Rounds, Tracey, & Hubert, 1992).

A more constrained version of the model, namely the circumplex model, requires that the distances between opposite, adjacent, and alternate types are equal (Tracey & Rounds, 1997). This model can be visually represented as an equilateral hexagon (see Figure 1). In the present study the focus falls on the less restrictive version of Holland's model of vocational personality types, namely the circular order model.

A meta-analysis of 77 R-I-A-S-E-C matrices by Tracey and Rounds (1993) provided support for the hypothesized circular ordering of the six personality types in the United States of America. The study also showed that the structure of the circular order model is invariant across gender. However, most of the correlation matrices included in the meta-analysis reflected data obtained from white English-speaking Americans and it is not clear whether the findings also apply to other ethnic or language groups.

It cannot be automatically assumed that the circular order model is valid in cultures and countries other than the U.S. Hence, it is important to empirically evaluate the cross-cultural generalizability of the model. If the circular order model does not fit in a particular country or culture, it indicates that the meaning of the six vocational personality types in that country or culture may be different from the meaning of the types in the U.S. This has important implications for career counseling practice—if the structural relations among the personality types are different in a new culture or country, then interpretations based on Holland's theory and research findings in the U.S. are not necessarily applicable. Rounds and Day (1999) summarizes the importance of cross-cultural studies into the structure of vocational interest measures:

A pressing question today involves whether vocational interest measures and scales can be applied cross-culturally and multiculturally. If different groups consistently respond in different patterns to the same measures, one explanation is that the groups have differing mental representations of the world of work. This is a matter of structure: If it is not cross-cultural, scores on interest inventories cannot be interpreted the same way for all people. In other word [sic], the construct validity of the measures is in doubt. (Rounds & Day, 1999, p. 104)

The support for the cross-cultural validity of Holland's circular order model has been mixed, with some researchers reporting support (see for instance Fouad & Dancer, 1992; Hansen, Sarma, & Collins, 1999; Harrington & O'Shea, 1980; Swanson, 1992), and others reporting limited or no support (see for instance Alves Ferreira & Hood, 1995; Feldman & Meir, 1976; Glidden-Tracey & Parraga, 1996; Haverkamp, Collins, & Hansen, 1994). One shortcoming of cross-cultural studies into the circular order model is that researchers often rely on visual inspection of R-I-A-S-E-C correlation matrices or graphical multidimensional scaling solutions to evaluate the fit between the data and the hypothesized circular order model. Rounds et al. (1992) emphasized that visual inspection provides inadequate tests of the circular order model.

Hubert and Arabie (1987) have provided researchers with a randomization test that can be used to statistically test hypotheses about ordered relations between variables in a correlation matrix. Rounds and Tracey (1996) used the randomization test in a comprehensive cross-cultural meta-analysis of R-I-A-S-E-C matrices that involved 18 different countries and several different ethnic groups in the U.S. The meta-analysis revealed that the data of the American minority and international groups did not fit the circular order model as well as the data from the American white majority group. However, in more recent studies using large representative samples, Day and Rounds (1998) and Day, Rounds, and Swaney (1998) did not find meaningful differences between American ethnic/racial groups in terms of Holland model-data fit. They explained that the difference between their results and those of Rounds and Tracey (1996) may be ascribed to sampling problems in the earlier study.

Holland's model of vocational personality types has also been widely used in South African career counseling research and practice. The main reasons for the acceptance of Holland's model in South Africa appear to be (a) the lack of a competing indigenous model of career interests, (b) the practical usefulness of the simple concepts of the model, and (c) the absence of appropriate cross-culturally validated standardized South African psychometric instruments.

Although Holland's model and related psychometric instruments are popular in South Africa, there have only recently been efforts to investigate the validity of the circular order model in the South African context. Du Toit (1988) and Gevers, du Toit, and Harilall (1995) reported support for the circular R-I-A-S-E-C ordering of the personality types for black students. Van der Walt (1994) reported that the structure of interests for a group of predominantly white adults corresponded in general with Holland's representation. However, using facet analysis, Wheeler (1992) did not find support for the hypothesized R-I-A-S-E-C ordering among black Grade 12 students. Watson, Schonegevel, and Stead (1997) also failed to find support for the R-I-A-S-E-C model among black students (across gender and socio-economic status).

It is important to note that none of the South African studies described above employed a precise test of the circular order model. Therefore, the objective of the present study was to statistically test the validity of Holland's circular order model for black South African students using Hubert and Arabie's (1987) randomization test.

## METHOD

### Participants

The participants were recruited from two South African provinces, namely the North West Province and the Eastern Cape Province. The North West participants were 459 men and 573 women who were randomly selected to represent the population of black students in the province. The mean age of the men and women was 19 years ( $SD = 2$  years) and 20 years ( $SD = 4$  years), respectively.

The Eastern Cape participants consisted of 144 men and 242 women. The mean age of the men and women was 19 years ( $SD = 3$  years) and 20 years ( $SD = 3$  years), respectively. A process of convenience sampling was used to collect the data for the Eastern Cape sample.

The two groups were treated separately for the following reasons: (a) the Eastern Cape group was predominantly from an urban environment and the North West group mainly from a rural environment; (b) the principal language of the Eastern Cape is isiXhosa and of the North West is seTswana.

## Instrument

The 1987 South African version of the Self-Directed Search (SDS; Gevers et al., 1995) was used to operationalize Holland's six personality types. The items for the 1987 South African SDS were primarily drawn from the 1985 American edition, but certain items from the DISCOVER version (Harris-Bowlsbey & Rayman, 1978) were also included in the questionnaire. The South African SDS contains 216 items and has four types of scales: activities, competencies, occupations, and rating of own abilities. It was standardized on a sample of 4,573 high school students. Reliability coefficients for the six types ranged between .77 and .88. These coefficients can be regarded as sufficiently high for research purposes. The medium of instruction at secondary schools in South Africa is English and the participants completed the English version of the SDS.

## Analysis

Hubert and Arabie's (1987) randomization test of hypothesized order relations was used to test the validity of the circular order model. This test determines the extent to which postulated circular orderings manifest in empirical data. Tracey (1997) explains that the first step in the randomization procedure is to completely specify the order predictions of the model of interest. The circular order model specifies that the six vocational personality types are arranged in a circular manner. This requires that the correlations between adjacent types be greater than those between all nonadjacent types and that the correlations between alternate types be greater than those between opposite types (Tracey & Rounds, 1997). A total of 72 order predictions were made. The next step is to examine the number of times the order predictions are met in the data correlation matrix. The statistical significance associated with the number of predictions met is obtained through a procedure where the rows and columns of the correlation matrix are randomly relabeled. Rounds et al. (1992) explain that there are 6! possible permutations, which means that the correlation matrix can be relabeled in 720 different ways. The exact probability associated with the original number of observed confirmations is equal to the proportion of relabelings that yield more predicted confirmations than the number confirmed within the observed correlation matrix.

The correspondence index can be used as a descriptive index of the correspondence between the hypothesized order relations and the observed order relations in a correlation or any other proximity matrix (Hubert & Arabie, 1987). This index reflects the proportion of confirmed predictions to total predictions minus the proportion of violations to total predictions (Hansen, Scullard, & Haviland, 2000). The correspondence index can take on values between -1 and 1, with 0 indicating chance agreement or disagreement. Rounds et al. (1992) explained that the correspondence index

can be used to compare the relative fit of competing theoretical models as well as to compare the relative fit of different matrices to a theoretical model. Although no specific cutoff value for suggesting a reasonable or good model data fit exists, values closer to 1 indicate a greater fit to a model. The correspondence indices of this study were compared with the mean correspondence index of the 24 international matrices based on the SDS in the Rounds and Tracey study (1996).

The SPSS ALSCAL algorithm for multidimensional scaling (MDS) was used to graphically examine the spatial relationships of the six vocational personality types. MDS is a set of statistical techniques that provide a multidimensional spatial representation of the structure of a given set of interrelated data. The relationships represented by the similarity data are expressed spatially, so that variables judged to be psychologically dissimilar are located graphically as distant points and psychologically similar data are represented as points closer in geometric space. The stress value (Kruskal's Stress Formula 1) indicates how well the obtained MDS configuration accounts for the proximity data. Stress values range from 0 to 1 with 0 indicating a perfect fit between the obtained spatial configuration and the relevant data. Kruskal and Wish (1978) suggested that stress values less than .10 indicate adequate fit. It is important to note that the stress value does not reflect the degree to which the data conforms to the hypothesized R-I-A-S-E-C order (Hansen, Scullard, & Haviland, 2000).

## RESULTS

Means and standard deviations for the women and men of the Eastern Cape and North West Provinces are found in Table 1. Tables 2 and 3 contain the correlation matrices of the North West and Eastern Cape samples, respectively. The results of the randomization test of hypothesized order relations are summarized in Table 4. This table contains the number of predictions met out of the possible 72 order predictions, as well as the correspondence indices and associated probabilities. The randomization test indicated that for the Eastern Cape participants, 53 of the 72 model predictions were met for the men and 52 for the women ( $p = .07$  for men; and  $p = .08$  for women). The correspondence indices were .49 and .48, respectively. The nonsignificant probabilities suggest that the number of predicted order relations violated is not significantly smaller than the number that would be expected under the null hypothesis of a random relabeling of the types. For the North West participants, 48 and 47 of the 72 order predictions were confirmed for the men and women, respectively ( $p = .03$  for men and women). The correspondence indices for the men and women were .35 and .32, respectively.

Overall, the results of the randomization test of hypothesized order relations suggest that for all four samples, the circular order model did not ade-

**Table 1**  
**Means and Standard Deviations of the Six Types**  
**of the Self-Directed Search (South African Version)**  
**for Eastern Cape and North West Province Students**

SDS types	Eastern Cape				North West			
	Women <sup>a</sup>		Men <sup>b</sup>		Women <sup>c</sup>		Men <sup>d</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Realistic (R)	11.4	7.7	18.1	9.9	14.4	7.8	20.4	8.5
Investigative (I)	20.7	10.3	19.4	9.8	25.2	8.7	24.2	8.6
Artistic (A)	20.6	9.9	21.0	11.0	22.5	9.3	21.5	9.6
Social (S)	26.1	8.7	23.5	9.7	28.7	8.2	27.8	8.7
Enterprising (E)	22.8	9.5	24.4	10.2	21.5	8.6	23.9	8.8
Conventional (C)	24.6	10.4	24.2	10.8	22.1	9.2	22.2	9.3

a.  $n = 242$ .

b.  $n = 144$ .

c.  $n = 573$ .

d.  $n = 459$ .

quately fit the data (although the probability levels of the North West Province men and women were statistically significant), with large numbers of nonconfirmed predictions and low correspondence index values.

To gain a better understanding of the results of the randomization test, it was compared to those obtained in studies conducted in other countries. Rounds and Tracey (1996) calculated correspondence indices for 96 R-I-A-S-E-C matrices from several different countries. However, the 96 matrices reflected data obtained with several different interest inventories. Since only the SDS was employed in the present study, it was decided to limit the comparisons only to those matrices that were obtained with the SDS. Accordingly, 24 matrices were selected from Rounds and Tracey's pool of 96 matrices. The correspondence indices and  $p$  values for the 24 international and the 4 South African matrices are presented in Table 5. The mean correspondence index for the 24 international indices (excluding the 4 South African matrices) was .45 with a standard deviation of .14. The correspondence indices for the Eastern Cape groups (.49 for men and .48 for women) were close to the mean, but the correspondence indices for the North West groups (.35 for men and .32 for women) were substantially lower than the mean. Rounds and Tracey concluded that the fit between the international matrices and Holland's model was unsatisfactory (U.S. benchmark was .70). Hence, because the fit obtained in the present study was no better than that reported by Rounds and Tracey for the international matrices, the results of the comparison support the conclusion of unsatisfactory fit for the South African groups.



**Table 2**  
**Intercorrelations of the Six Types of the Self-Directed Search**  
**(South African Version) for North West Province Students**

Type	R	I	A	S	E	C
Realistic (R)		.575	.572	.545	.603	.590
Investigative (I)	.538		.439	.544	.431	.485
Artistic (A)	.418	.329		.682	.687	.616
Social (S)	.422	.497	.609		.689	.614
Enterprising (E)	.500	.387	.653	.700		.774
Conventional (C)	.491	.475	.576	.626	.791	

*Note.* Correlations based on the women ( $n = 573$ ) are presented above the diagonal; correlations based on the men ( $n = 459$ ) are presented below the diagonal.

**Table 3**  
**Intercorrelations of the Six Types of the Self-Directed Search**  
**(South African Version) for Eastern Cape Province Students**

Type	R	I	A	S	E	C
Realistic (R)		.512	.364	.281	.231	.165
Investigative (I)	.536		.290	.490	.068	.087
Artistic (A)	.497	.276		.512	.497	.406
Social (S)	.443	.464	.526		.460	.362
Enterprising (E)	.093	.023	.274	.448		.757
Conventional (C)	.110	.114	.221	.386	.758	

*Note.* Correlations based on the women ( $n = 242$ ) are presented above the diagonal; correlations based on the men ( $n = 144$ ) are presented below the diagonal.

The data were also subjected to a multidimensional scaling analysis in order to obtain graphical representations of the relations between the six vocational personality types. The solutions of the two-dimensional metric ALSCAL analyses for the four groups are presented in Figures 2 to 5. The stress values for the different groups were .15 for the North West Province men, .13 for the North West Province women, .06 for the Eastern Cape Province men, and .25 for the Eastern Cape Province women. These values, with the exception of the Eastern Cape men, suggest that the two-dimensional model did not fit the data very well.

The plots in Figures 2 to 5 indicate differences in the configurations and ordering of the six personality types. The ordering of the personality types for the Eastern Cape (see Figure 2) and North West women (see Figure 3) almost corresponded with that of the R-I-A-S-E-C model—the only excep-

**Table 4**  
**Results of the Randomization Test and Multidimensional Scaling**  
**Analysis for the Eastern Cape and North West Province Groups**

	Randomization Test			Multidimensional
	Predictions	<i>p</i>	CI	Stress
<b>Eastern Cape Province</b>				
Men	53	.07	.49	.06
Women	52	.08	.48	.25
<b>North West Province</b>				
Men	48	.03	.35	.15
Women	47	.03	.32	.13

*Note.* CI = correspondence index.

tion was the reversal of A and S (R-I-S-A-E-C). The shape of the configuration for the North West women roughly approximated a circular structure.

The configuration of the Eastern Cape men (see Figure 4) also almost conformed to the R-I-A-S-E-C model—the exception was the reversal of I and R (I-R-A-S-E-C). However, the shape of the multidimensional scaling solution did not approximate a circular structure. The ordering of the personality types for the North West men (see Figure 5) was R-I-S-C-E-A and showed several violations of the order hypothesis. The shape of the configuration also did not approximate a circular structure. It is interesting to note that the Artistic type was incorrectly placed in all four multidimensional scaling analyses. This finding suggests that the meaning of this type may be different from that postulated by Holland's circular order model.

## DISCUSSION

The results of the randomization test of hypothesized order relations for the Eastern Cape men and women indicated nonsignificant probabilities and relatively low correspondence indices (see Table 4). This leads to the conclusion of an unsatisfactory fit between the observed data and the hypothesized circular order model for the Eastern Cape groups. The results of the randomization test for the North West men and women indicated significant probabilities but low correspondence indices (see Table 4). It is interesting to note that the correspondence indices for the North West groups were lower than those of the Eastern Cape groups. This seems counterintuitive, because the fit of the North West group was better than that of the Eastern Cape group in a statistical sense. It should be kept in mind, however, that the cor-

*(text continues on p. 74)*

**Table 5**  
**Comparison of Self-Directed Search**  
**Correspondence Index Values in Different Countries**

Source	N	Gender	Country	CI	<i>p</i>
<b>Self-Directed Search</b>					
Bingham (1977/1978)	93	F	U.S. African American	.43	.07
Boyle (1992)	401	M	Australia	.32	.02
Erlianto (1982)	146	M	Indonesia	.58	.02
Fitzsimmons & Melnychuk (1979)	200	M/F	Canada	.47	.07
Mercurius-Fraser (1980)	444	F	Guyana	.35	.05
Mercurius-Fraser (1980)	387	M	Guyana	.30	.13
Mercurius-Fraser (1980)	144	F	Guyana	.44	.07
Mercurius-Fraser (1980)	156	M	Guyana	.25	.05
Sedlacek (1992)	298	M/F	U.S. African American	.42	.05
<b>SDS:</b>					
<b>Australian adaptation</b>					
Lokan (1988)	920	F	Australia	.58	.02
Lokan (1988)	849	M	Australia	.22	.05
<b>SDS: Chinese translation</b>					
Jin (1986/1987)	228	F	Taiwan	.47	.05
Jin (1986/1987)	247	M	Taiwan	.32	.08
Jin (1986/1987)	205	F	Taiwan	.57	.02
Jin (1986/1987)	182	M	Taiwan	.40	.08
<b>SDS: Hebrew translation</b>					
Meir (1992)	160	M/F	Israel	.75	.03
Meir & Ben-Yehuda (1976)	217	M/F	Israel	.50	.03
Peiser (1984)	870	M	Israel	.78	.02
<b>SDS: Malay translation</b>					
Salleh (1984/1985)	86	F	Malaysia	.36	.05
Salleh (1984/1985)	80	M	Malaysia	.50	.02
<b>SDS: Pakistan adaptation (English)</b>					
Khan (1992)	133	F	Pakistan	.46	.03
Khan (1992)	243	M	Pakistan	.53	.02
<b>SDS:</b>					
<b>New Zealand adaptation</b>					
Tuck & Keeling (1980)	252	F	New Zealand	.33	.05
Tuck & Keeling (1980)	247	M	New Zealand	.46	.07
<b>SDS: South African adaptation (English)</b>					
du Toit & de Bruin	144	M	South Africa (Eastern Cape)	.49	.07
du Toit & de Bruin	242	F	South Africa (Eastern Cape)	.48	.08
du Toit & de Bruin	459	M	South Africa (North West)	.35	.03
du Toit & de Bruin	573	F	South Africa (North West)	.32	.03

*Note.* The data in the rows above the South African data are from “Cross-Cultural Structural Equivalence of RIASEC Models and Measures,” by J. Rounds and T. J. Tracey, 1996, *Journal of Counseling Psychology*, 43, pp. 317-318. Copyright 1996 by the American Psychological Association. Adapted with permission.

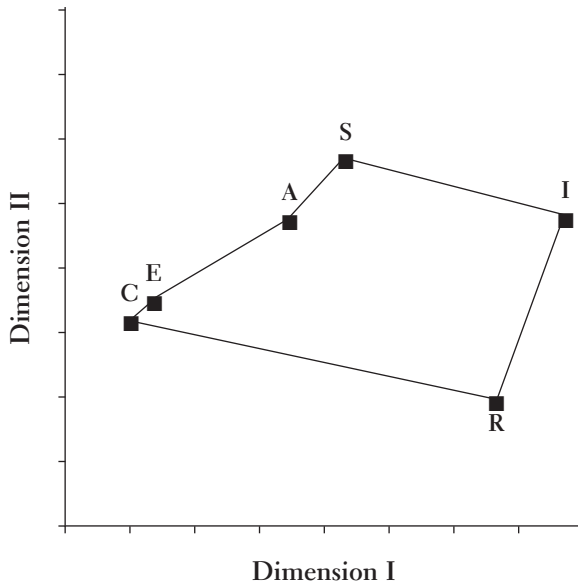


Figure 2. Multidimensional scaling solutions based on Holland's six vocational personality types for Eastern Cape women.

R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

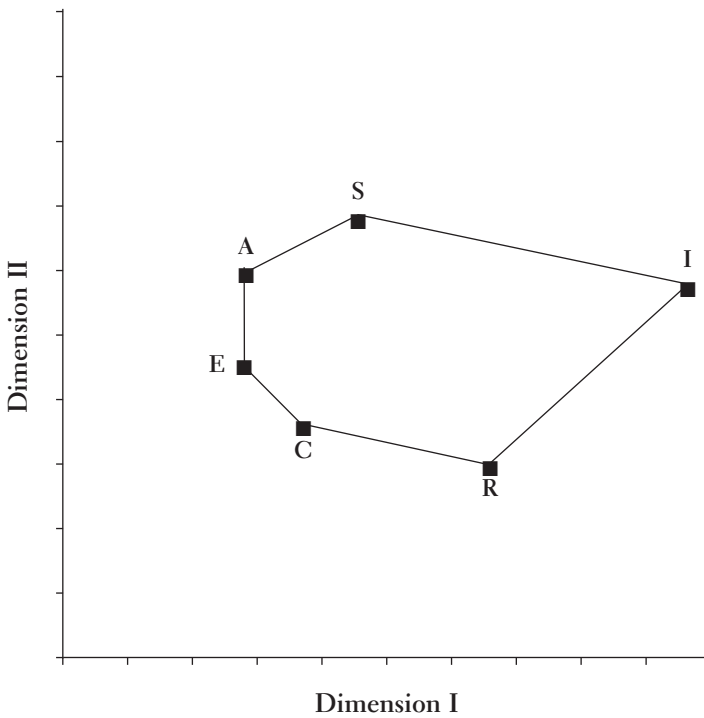


Figure 3. Multidimensional scaling solutions based on Holland's six vocational personality types for North West women.

R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

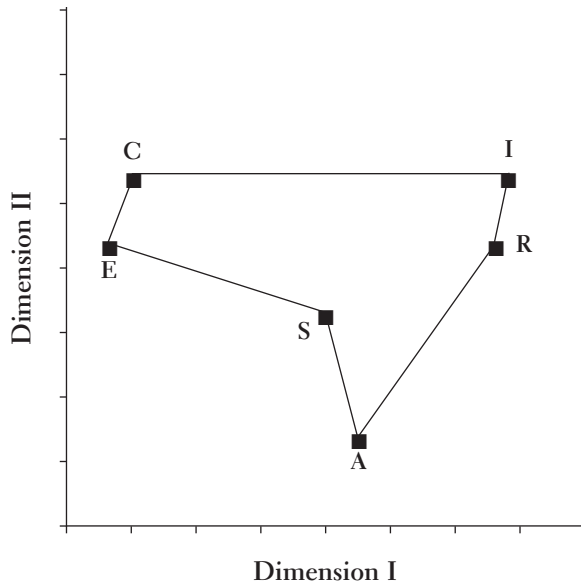


Figure 4. Multidimensional scaling solutions based on Holland's six vocational personality types for Eastern Cape men.

R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

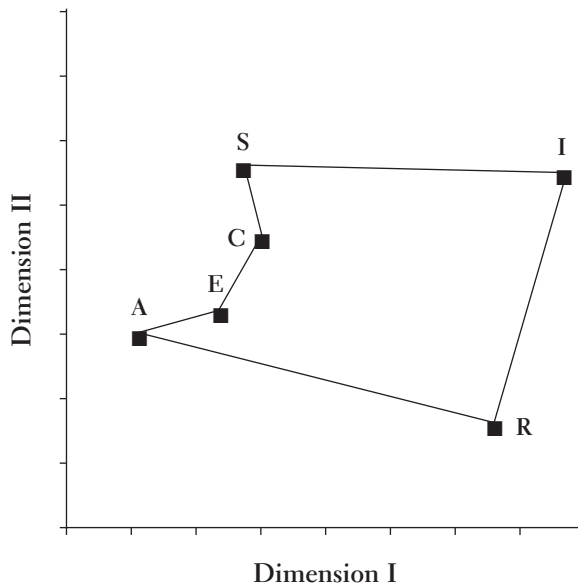


Figure 5. Multidimensional scaling solutions based on Holland's six vocational personality types for North West men.

R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional.

respondence index is only an interpretive aid and not necessarily related to the results of the probability test (T.J.G. Tracey, personal communication, January 23, 2001). The significant probabilities for the North West groups show that the model fit is beyond chance, but the low correspondence indices suggest that the absolute correspondence between the observed matrices and Holland's model is poor. It is concluded that the validity of the hypothesized model for the North West groups has not been supported. This conclusion is supported through the comparison of the results of the present study with those obtained in several other countries.

The results of the MDS analyses also suggested an unsatisfactory fit between the observed data and the hypothesized circular order model. The expected R-I-A-S-E-C ordering was not observed in any of the four MDS solutions. In this regard the Artistic type appeared to be the one most consistently misplaced. Furthermore, only the solution of the North West women approximated a circular or hexagonal shape.

Hansen et al. (2000) pointed out that cultural values influence "how individuals mentally organize the world of work and their place in it" (p. 160). A commonly held view is that black South Africans emphasize a value called "ubuntu." This value is associated with collectivism and requires that the needs of the group should be given preference over the needs of the individual. The essence of ubuntu is expressed in the saying, "A person is a person because of people." This value is in contrast to the emphasis that western societies put on individual achievement, satisfaction, and actualization. It is possible that this contrast in values can manifest in differences in the meaning of vocational interests. Specifically, in societies that value ubuntu one would expect interests to play a less important role in career choice than it would play in societies where self-actualization and fulfillment of the individual is prized.

Hansen (1987) argued that socio-economic factors may explain differences in the structure of interests in different cultural groups. In this regard it is important to note that South Africa's unemployment rate is estimated to be as high as 36.2% (Statistics South Africa, 1999). This high level of unemployment can conceivably play an important role in young black South Africans' perceptions of occupations and the world of work. However, Watson et al. (1997) reported the interesting finding in South Africa that the interest data of a lower socioeconomic group showed a better correspondence with Holland's model than did the interest data of a middle-class socioeconomic group.

The high intercorrelations between the R-I-A-S-E-C types in all four groups also provide a possible explanation for the poor fit of the circular order model. It is possible that the participants expressed a feeling of hope of gaining employment while completing the SDS. In the light of the high unemployment rate in South Africa, they may have thought that if they indicated interest in several fields it would improve their chances of being employed. In this regard it is important to note that many South Africans do not have

the opportunity to choose an occupation on the basis of their preferences and dislikes.

A further possible explanation for the unsatisfactory fit between the data and Holland's model is that the participants did not fully understand the meaning of the items. It should be remembered that the participants completed the SDS in English, which in almost all the cases would have been their second or even third language. An interesting question is whether a better fit can be obtained if the SDS is translated into isiXhosa and seTswana.

In summary, the results of the randomization test of hypothesized order relations and the multidimensional scaling analyses did not provide support for the structural validity of Holland's circular order model of vocational personality types. Although this finding could lead one to question whether black South Africans perceive the world of work and the role that interests play in the choice of work in a way that correspond with Holland's model of vocational personality types, it is perhaps too early to draw such a strong conclusion. Further research on the influence of language on the structure of interests or vocational personalities should shed light on whether the poor fit obtained in the present study is the result of language difficulties. In this regard it is necessary to translate the SDS into indigenous South African languages and to then test the validity of Holland's circular order model with participants that completed the SDS in their first language. If a poor fit is still obtained in such studies, the validity of interest inventories that are based on Holland's circular order model in the South African context would have to be questioned.

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