

# Cross-Cultural Validity of Holland's Model in Hong Kong

Jiing-lih Farh

*Hong Kong University of Science and Technology, Hong Kong*

Frederick T. L. Leong

*The Ohio State University*

and

Kenneth S. Law

*Hong Kong University of Science and Technology, Hong Kong*

While Holland's model has been widely tested and found broad support in the West, it has not been tested in Hong Kong. Using a sample of 1813 entering freshmen, we investigated the cross-cultural validity of Holland's models of six interest or personality types in Hong Kong. Results indicated: (a) Holland's model as operationalized by UNIACT has considerable external validity; (b) the internal structure of the UNIACT was generally consistent with the formulations by Holland; (c) the cultural value of traditionality affected the fit between Holland's model and the student data in that Hong Kong students who hold stronger traditional values tended to behave less consistently with Holland's model than those who hold weaker traditional Chinese values. These findings were discussed in terms of their implication for future cross-cultural vocational psychology research and practices. © 1998 Academic Press

Holland's theory of vocational interests (Holland, 1997) is one of the most popular models within the vocational interest literature (Borgen, 1986; Brown & Brooks, 1990). Holland proposed that there are six vocational personality types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC) and that there exists a natural match between these interest types and corresponding work environments with the same label. According

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to Holland's theory, people search for congruent environments that let them exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles (Holland, 1985, p. 4). Therefore, realistic types seek realistic environments, social types seek social environment, and so forth. Persons who evidence high levels of congruence between their vocational or personality type and their work environments are most likely to have high levels of job satisfaction and longer tenure at their jobs.

This study explored the cross-cultural validity of Holland's theory in Hong Kong. Following Leong's (1997) suggestion, we examined both the external and internal validity of Holland's theory for a large sample of Hong Kong university students. In addition, Leong (1997) recommended that cross-cultural career psychology research adopt a combination of the etic and emic approaches. The integration of the two approaches allows for the inclusion of culture-specific variables in research design to help increase the explanatory power of career theories. In a transitional society such as Hong Kong where traditional (Chinese) values co-exist with modern, Western values, individual differences in value orientation may affect their vocational behavior. Therefore, the purposes of our study were threefold: (a) to assess the internal or structural validity of Holland's model as operationalized by the UNIACT, for a population in Hong Kong; (b) to determine if Holland's theory has external validity in Hong Kong; and (c) to determine if cultural value of traditionality moderates the fit of Holland's RIASEC structure to Hong Kong data.

In addition to the congruence hypothesis, Holland's theory further specifies that these six interest types are arranged in R-I-A-S-E-C order to form a circular structure. There are two versions of Holland's structural hypotheses that have been distinguished in the literature: the circular order hypothesis and the circumplex hypothesis (Rounds, Tracey, & Hubert, 1992). The circular order hypothesis predicts that the interpoint distances for the six interest types are "inversely proportional to the theoretical relationships between them" (Holland, 1973, 1985, p. 5). In terms of RIASEC correlations, this hypothesis predicts that (a) the pair-wise correlations between adjacent types will be larger than all other correlations and (b) the pair-wise correlations between alternate types, for example, realistic and artistic, will be larger than the correlations between opposite types. The circumplex hypothesis makes predictions (a) and (b) and adds a third prediction, namely, the correlations between each of the adjacent types will be equal, the correlations between each of the alternate types will be equal, and the correlations between each of the opposite types will be equal.

Holland's theory and its accompanying structural hypotheses have been widely tested in the United States providing substantial empirical support (Holland, 1997). In fact, "the success of Holland's RIASEC interest and occupational classification has led to extensive revision of widely used interest measures" (Rounds, 1995, p. 178) such as the Strong Interest Inventory (Hansen & Campbell, 1985), the Career Decision-Making Interest Survey (Harrington & O'Shea,

1993), the Career Assessment Inventory (Johansson, 1986), and the UNIACT of the American College Testing Program.

Although there is some support for the cross-cultural validity of Holland's theory (Holland, 1997; Harrington & O'Shea, 1993), there is some research which showed specific sample differences across cultures while applying Holland's model (Rounds & Tracey, 1996; Tracey, Watanabe, & Schneider, 1997). Thus far, the cross-cultural generalizability of Holland's theory to Hong Kong has not yet been empirically investigated. The evaluation of the internal or structural validity of Holland's model is the first of a two-part procedure to assess the etic or universal aspects of Holland's model. If Holland's model is indeed an etic model of human behavior, then the structure of a vocational interest pattern should generalize across cultures.

The second part of evaluating the etic aspects of Holland's model assesses its external validity. An etic model should demonstrate similar relations to external and criterion variables consistently across different cultures. In testing the external validity of Holland's theory in Hong Kong, we first investigated the agreement between interests and choices. According to Holland, individuals who plan to choose one of the six job categories (e.g., an Investigative job) will have a higher score on the corresponding interest type (e.g., Investigative interest) than those who plan to choose other careers. To the extent that career choice relates to interests, the external validity of Holland's theory is supported.

An alternative way to validate the external validity of Holland's theory assesses relationships between students' majors and their career interests. Three broad majors (science, engineering, and business management) were included in this study. Based on Holland's theory, we expected science majors to have higher scores on Investigative interest, engineering majors to have higher scores on Realistic interest, and business majors to have higher scores on Enterprising, Conventional, and Social interests. To the extent that students with different majors have different interest profiles, the validity of Holland's theory is confirmed.

The second major approach in our study evaluated the potential contribution of emic or culture-specific variables to the understanding and prediction of vocational behavior. For this approach, we examined the role of cultural values in affecting the fit of Holland's model to non-U.S. populations, specifically Hong Kong. Although Holland did not include culture as part of his formal theory, he did suggest that factors such as ethnicity and geography are potential boundary conditions for his theory (Holland, 1997). From a cross-cultural perspective, Holland's theory and its associated measuring instruments were indigenous to the United States. Only recently researchers began to examine whether Holland's theory generalizes to non-U.S. cultural contexts (Fouad & Dancer, 1992; Khan, Alvi, Shaukat, Hussain, & Baig, 1990; Rounds & Tracey, 1996; Yu & Alvi, 1996).

Based on the pioneer work of Hofstede (1980), countries around the world can be classified into clusters based on similarities and differences in fundamental cultural attributes (e.g., individualism–collectivism, power distance). One general hypothesis is that the generalizability of Holland's theory to a non-U.S. cultural context depends

on the similarity of that culture to the United States. The greater the similarity of a foreign culture to the US culture, the greater the likelihood that Holland's theory will transfer. For example, Rounds & Tracey (1996) discussed the covariation of the fit of each model with Hofstede's cultural values of individualism–collectivism and masculinity–femininity. Their expectation was that countries with high collectivism and masculinity values would place constraints on the pattern of vocational preferences, leading to poorer model fits than countries with high individualism and femininity values. They did find that countries with more individualism values fit the alternative partition model better than countries with more collective values. Further research aimed at establishing similar links between cultural variables and Holland's model seems important.

A primary focus of this emic aspect of our study is how Hong Kong fits into Holland's theoretical framework. In terms of the cultural context, Hong Kong is at the crossroads of East and West. While the city remains predominantly ethnic Chinese, 150 years of British rule have imbued it with a strong Western orientation. Like many societies undergoing modernization, not all segments of Hong Kong population assimilate Western values at the same rate. Within Hong Kong, some people hold traditional Chinese values and some have completely given up traditional values. Here our general expectation is that the structure-of-interest matrix of those Hong Kong students who have strong traditional values will have a poorer fit to Holland's structural model than those who have less traditional values.

A recent study in Taiwan illustrated that individual differences in endorsing traditional Chinese cultural values affect how Taiwanese respond to social realities. Farh, Earley, and Lin (1997) examined organizational citizenship behaviors (OCB) in relation to organizational justice and cultural value in eight companies in Taiwan. Results of their study demonstrated that organizational justice (distributive and procedural) was unrelated to OCB for employees who endorse traditional Chinese values but strongly related to OCB for those who do not. Farh and his colleagues argued that for traditional Chinese, their behaviors (e.g., OCB) are heavily influenced by social roles in a given situation and thus are less likely to be affected by their perceived justice. In contrast, those who do not endorse traditional values are less concerned about social roles and more freely to engage in OCB based on perceived justice. These results suggest that if a Hong Kong sample is classified based on the extent to which they endorse traditional values, those who hold traditional values are less likely to pursue careers consistent with Holland's theory than those who do not endorse traditional Chinese values. Therefore, we hypothesized that the RIASEC structure fits the less traditional Hong Kong students better than the more traditional students.

## METHOD

### *Sample*

The sample consisted of 1813 freshmen enrolled in a science and technology university in Hong Kong. Sixty-two percent of the sample was male and 38%

female. The average age of the sample was 19.37 with 98% of the students between ages 18 and 21. Nearly all of the sample (over 99%) were ethnic Chinese. Because the university has three undergraduate colleges (i.e., science, engineering, business), the sample included three broad majors: science (23.2%), engineering (38.5%), and business and management (38.3%). There was a higher percentage of males in science (64%) and engineering (87%) than in management (37%).

### *Measures*

*Career interests types.* Career interest was measured by the Unisex edition of the ACT Interest Inventory (UNIACT) for Grade 12. UNIACT measures the six types in Holland's theory: Technical (Realistic), Science (Investigative), Arts (Artistic), Social Service (Social), Business Contact (Enterprising), and Business Operations (Conventional). For ease of presentation, we will use Holland's terminology to refer to each of the six UNIACT interest types. UNIACT has 90 items with 15 items measuring each of the six Holland's types. Each item refers to a specific activity measured on a three-point scale (dislike, indifferent, or like). Prior to the survey, we pilot tested UNIACT with several individuals of high school level of education to identify items that may contain English phrases or vocabulary difficult for freshmen to understand. A total of seven items was identified. Chinese translations for these items were added to the English questionnaire to facilitate understanding. Cronbach's alpha for the six scales of this sample was .82 for realistic, .88 for investigative, .87 for artistic, .82 for social, .85 for enterprising, and .88 for conventional. These coefficients are somewhat lower than those reported in the UNIACT technical manual (Swaney, 1995, p. 30) but still acceptable.

*Career choice.* Career choice was measured by an open-ended question: "what kind of a job do you think you will choose when you are through with school?" We coded students' responses using the first-level code from Holland's Dictionary of Occupational Codes (Gottfredson & Holland, 1990).

*Academic major.* Students reported their majors by indicating the school in which they were enrolled (i.e., science, engineering, and business). We did not measure majors at the departmental level for two reasons. First, freshmen in the business school do not declare a major until the beginning of their second year. Second, the various majors in science and in engineering are relatively homogeneous. The school of science includes five majors: biochemistry, biology, chemistry, math, and physics. The school of engineering includes six majors: chemical engineering, civil and structural engineering, computer science, electrical and electronic engineering, industrial engineering, and mechanical engineering.

*Traditionality.* Traditional values orientation was measured by the Respect for Authority scale taken from the Chinese Individual Traditionality Inventory, an indigenous instrument developed by Yang, Yu, and Yeh (1989). Respect for authority is a key aspect of individual traditionality for Chinese people in Taiwan. The original scale for respect for authority has 15 items. We adopted a

short version of this scale used by Farh, Earley, and Lin (1997), which includes the following five items: "The chief government official is like the head of a household. The citizen should obey his decisions on all state matters"; "The best way to avoid mistakes is to follow the instructions of senior persons"; "Before marriage, a woman should subordinate herself to her father. After marriage, to her husband"; "When people are in dispute, they should ask the most senior person to decide who is right"; "Those who are respected by parents should be respected by their children". The Cronbach alpha for this scale was .60.

### *Procedure*

As a part of the university orientation program organized by the student affairs office, all freshmen complete several surveys and physical fitness testing. This study's measure were included in the 1996 testing as a pilot test for their potential future use. UNIACT was selected from several interest inventories because of its relative short length, wide popularity—about 4.2 million completed each year—and sound psychometric properties (Swaney, 1995).

### *Analysis*

Rounds, Tracey, and Hulbert (1992) have reviewed the various statistical methods for evaluating Holland's structural hypotheses. For circumplex hypothesis, they recommend that the researchers use confirmatory factor analysis (CFA) to test whether a RIASEC correlation matrix supports Holland's circumplex. According to these authors, the circumplex structure can be operationalized by using only three parameters to account for the relations within the matrix. One parameter ( $r_1$ ) represents the correlations between adjacent types which are assumed to be equal and greater than remaining RIASEC correlations. A second parameter ( $r_2$ ) represents the correlations between alternate types which are assumed to be equal and greater than correlations between opposite types, but less than correlations between adjacent types. The third parameter ( $r_3$ ) represents the correlations between opposite types which are assumed to be equal. In CFA the fit of any model to the data is determined by examining several fit indices as each individual index is limited in its own way and does not provide complete information (Rounds et al., 1992). These indices include the overall  $\chi^2$  statistic, the goodness-of-fit index (GFI, Joreskog and Sorbom, 1993), the comparative fit index (CFI, Bentler, 1990), the Tucker–Lewis index (TLI, Tucker & Lewis, 1973), and the root mean square error of approximation (RMSEA, Steiger, 1990). Among these indices, the overall  $\chi^2$  statistic is the only one that allows for a significance test of the overall fit of the model to the data. This statistic, however, is not very useful because it is greatly affected by sample size and model complexity. Researchers have reviewed the strengths and weaknesses associated with these fit indices (e.g., Joreskog & Sorbom, 1993). For GFI, CFI, and TLI, values above .90 suggest acceptable fit (Bentler & Bonnett, 1980, Gerbing & Anderson, 1988). For RMSEA, values up to .08 represent a reasonable fit (Browne and Cudeck, 1993).

In addition, CFA allows direct examination and statistical testing of the extent that a hypothesized structure varies across multiple samples. This multigroup procedure compares the  $\chi^2$  value for a "constrained" model (using the same set of parameters for all groups) with that of a "relaxed model" (allowing different parameters for different groups). A significant change in model  $\chi^2$  between the two models indicates that the parameters are not the same for the various groups. In the context of testing Holland's model, this implies that the hypothesized structure does not fit the various groups equally well.

For the circular order hypothesis, Rounds and his colleagues (1992) recommended a randomization test originally proposed by Hubert and Arabie (1987). This test uses a random relabeling strategy as a null conjecture to produce the exact probability that a certain number of the hypothesized order relations can be obtained by chance given a specific RIASEC correlation matrix. On top of counting the number of observed correlations that match Holland's circular order model, Hubert and Arabie (1987) proposed a correspondence index (CI) for evaluating results of the randomization test. The correspondence index is defined as  $(A-D)/(A+D+T)$ , where  $A$  is the number of order predictions met,  $D$  is the number of violations of the order predictions, and  $T$  is the number of ties. The correspondence index can be interpreted as the difference between the probability that the order prediction is met and the probability that the order prediction is violated. A high correspondence index means that the orders of the observed correlations match well with the predicted order based on Holland's circular order model. For example, a CI of .5 would indicate that 75% of the predictions were met while 25% were not (assuming no ties). It is worth noting that in evaluating Holland's structural models, CFA and the randomization test are complementary tools because they are based on a different logic and focus on different aspects of the model.

## RESULTS

### *Internal Validity of Holland's Theory*

We used CFA with LISREL 8 to examine whether the UNIACT data can be represented by Holland's six types (Joreskog and Sorbom, 1993). Because the UNIACT has 15 items for each type, a CFA with a large number of indicators per latent factor often does not converge and tends to produce a poor fit even when the model is relatively accurate. To increase the power of the analysis, the usual practice is to reduce indicators by averaging several indicators and then using their composite as new indicators for the latent constructs (Mathieu & Farr 1991; Mathieu, Hofmann, and Farr, 1993). Following this practice, we averaged every five items measuring the same interest type to form new indicators for each latent construct. This procedure resulted in three indicators for each interest type. The CFA of six latent factors with 18 indicators resulted in a model  $\chi^2$  of 1356.99 with 120 degrees of freedom ( $p < .01$ ). The large  $\chi^2$  is not surprising given our large sample size ( $N = 1813$ ). Because all model fit indices fall in a reasonable

TABLE 1a  
Intercorrelations of Holland's Interest Types as Measured by UNIACT ( $N = 1674$ )

	1	2	3	4	5	6
1. Realistic	1.00					
2. Investigative	.637**	1.00				
3. Artistic	.367**	.263**	1.00			
4. Social	.298**	.299**	.376**	1.00		
5. Enterprising	.170**	.100**	.328**	.591**	1.00	
6. Conventional	.265**	.096**	.128**	.368**	.661**	1.00

range (GFI = .92, CFI = .93, TLI = .92, RMSEA = .08), this suggests that Holland's theory of six types as measured by UNIACT fits the Hong Kong data reasonably well.

Next, we examined if the RIASEC correlation matrix for the Hong Kong sample meets the rigid requirements of Holland's circumplex model. Table 1a shows the correlations among the six interest types. A close examination of the matrix shows that while the general pattern coincides with Holland's predictions, there are several notable exceptions (e.g., the lower-than-expected correlations between Artistic and Investigative, between Artistic and Social, between Conventional and Realistic, and higher-than-expected correlations between Social and Realistic).

We then used CFA to test whether the RIASEC correlation matrix reported in Table 1a supports Holland's circumplex model (see Table 1b). This analysis resulted in a model  $\chi^2$  value of 736.51 with 12 degrees of freedom ( $p < .01$ ). Furthermore, all model fit indices fell below the acceptable range (GFI = .88, CFI = .78, TLI = .73, RMSEA = .19). Thus, we concluded that the structure-of-interest data of the Hong Kong sample do not support Holland's circumplex

TABLE 1b  
Intercorrelations of Holland's Interest Types for High and Low Traditionality Groups

	HREA	HINV	HART	HSOC	HENT	HCON
HREA	NA	.649**	.348**	.242**	.129**	.246**
HINV	.625**	NA	.269**	.274**	.083*	.071*
HART	.386**	.253**	NA	.335**	.247**	.073*
HSOC	.350**	.320**	.411**	NA	.547**	.318**
HENT	.207**	.109**	.400**	.6279**	NA	.645**
HCON	.283**	.121**	.188**	.426**	.684**	NA

*Note.* The lower diagonal is the correlations of Holland's interest types as measured by UNIACT for high traditionality group ( $N = 844$ ). The upper diagonal is the correlation matrix of Holland's interest types as measured by UNIACT for low traditionality group ( $N = 824$ ).

\*  $p < .05$ .

\*\*  $p < .01$ .

TABLE 2

Means, Standard Deviations, and Results of *t*-tests of Holland's Interest Types by Career Choice

Career choice comparison	Cell size	Mean	SD	Mean diff.	<i>t</i> -values	Effect size ( $\eta^2$ )
Realistic vs Nonrealistic	501	31.85	5.84	1.59	0.86**	.016
Investigative vs Noninvestigative	927	30.25	5.96			
Artistic vs Nonartistic	198	34.96	6.42	2.87	5.65**	.022
Social vs Nonsocial	1228	32.10	6.66			
Enterprising vs Nonenterprising	16	30.81	5.48	1.41	.83	.001
Conventional vs Nonconventional	1417	29.41	6.78			
	191	37.08	4.98	.38	1.00	.000
	1239	36.70	4.94			
	440	35.74	5.38	3.24	10.06**	.066
	990	32.50	5.74			
	78	35.13	5.83	2.44	3.31**	.008
	1346	32.68	6.37			

*Note.* The dependent variable used in each analysis varies depending on the specific comparison groups involved. For example, the dependent variable for the Realistic vs Nonrealistic group comparison is Realistic interest scores; for Investigative vs Noninvestigative group comparison it is Investigative interest scores, etc.

\*\*  $p < .01$  (two tailed).

model. We then proceeded with the randomization test to determine if the Hong Kong data supports the less restricted circular order model. This test showed that 57 of 72 order predictions were consistent with the circular order model with two ties ( $p < .02$ ), resulting in a correspondence index of .61. While the random relabeling hypothesis can be rejected for the Hong Kong sample, the correspondence index is much lower than what was typically found with the U.S. data (CI = .78 to .92). Thus, the Hong Kong data do not support Holland's circular order model either.

#### *External Validity of Holland's Theory*

*Job choice.* We classified each student's job choice into one of six mutually exclusive Holland job types. Out of the 1813 students who completed the survey, 16% of the students were undecided about their future jobs. Another 3% of the students provided ambiguous answers to the question which could not be coded meaningfully (for example, "government job"). Out of the 1468 codable responses (81% of the entire sample), 35% were classified as Realistic, 31% Enterprising, 14% Investigative, 13% Social, 6% Conventional, and 1% Artistic.

According to Holland's theory, students who plan to choose a certain type of career (say an investigative type of job) will have higher scores in the corresponding interest dimension (i.e., Investigative type) than those who plan to choose other career types. Table 2 presents results of *t*-tests of differences in means for the six job choice groups versus other career types. For example, in the

TABLE 3  
Means, Standard Deviations, and Results of ANOVA of Holland's Interest Types by Major

Dimensional scores	Science ( <i>n</i> = 390)		Engineering ( <i>n</i> = 644)		Business ( <i>n</i> = 650)		<i>F</i> -values	Effect size ( $\eta^2$ )
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>		
Realistic	31.40 <sup>a</sup>	5.66	32.31 <sup>b</sup>	5.55	28.73 <sup>c</sup>	5.92	66.92**	.074
Investigative	34.65 <sup>a</sup>	6.56	32.98 <sup>b</sup>	6.41	30.83 <sup>c</sup>	6.77	43.45**	.049
Artistic	29.41 <sup>a,b</sup>	6.76	28.79 <sup>a</sup>	6.66	30.32 <sup>b</sup>	6.88	8.43**	.001
Social	36.34 <sup>a</sup>	4.77	35.90 <sup>a</sup>	5.33	37.48 <sup>b</sup>	4.64	17.35**	.020
Enterprising	31.84 <sup>a</sup>	5.54	31.74 <sup>a</sup>	5.90	35.66 <sup>b</sup>	5.07	99.09**	.106
Conventional	31.01 <sup>a</sup>	6.15	31.26 <sup>a</sup>	6.09	34.83 <sup>b</sup>	6.05	72.23**	.079

<sup>a,b,c</sup> Means not sharing common superscripts differ significantly at the .05 level on Scheffe test.

\*\*  $p < .01$ .

first two rows of Table 2, we compared the student group who planned to choose realistic jobs versus all others in terms of Realistic interest scores. The results showed that, consistent with Holland's model, those who preferred realistic jobs had significantly higher Realistic interest than those who preferred other jobs (means = 31.85 vs 30.25,  $t = 4.86$ ,  $p < .01$ ). Similarly students who preferred investigative jobs had significantly higher Investigative interest than those who preferred other types (i.e., noninvestigative) of jobs (means = 34.96 vs 32.10,  $t = 5.65$ ,  $p < .01$ ). Similar findings were also observed on Enterprising and Conventional interests. While the pattern of results for Artistic and Social interests was also consistent with Holland's prediction, it was nonsignificant. Thus, Holland's theory was partially supported.

*Academic major.* It is expected that relative to other major groups, science majors will have higher scores on Investigative, engineering majors have higher scores on Realistic, and business majors have higher scores on Enterprising, Conventional, and Social interests. Table 3 presents results of one-way ANOVA, means, and standard deviations of interest scores by majors. The results indicated that science majors scored significantly higher than engineering or business majors on Investigative interest. Engineering majors scored significantly higher than science or business majors on Realistic interest. Finally, business majors scored significantly higher on Social, Enterprising, and Conventional interests than science or engineering students.

#### *Traditionality and Holland's Structural Models*

We used the multigroup procedures of CFA to test if cultural values of traditionality affect the fit of Holland's circumplex model to Hong Kong data. Because traditionality is correlated with gender and major, we conducted a median split based on traditionality within each of the gender-major groups. This resulted in a high and a low traditionality group with equal proportion of males,

TABLE 4  
Results of Confirmatory Factor Analyses of Holland's Circumplex Model

Model	Model $\chi^2$	<i>df</i>	$\chi^2$	GFI	CFI	TLI	RMSEA
Overall model	736.51**	12		.88	.78	.73	.19
Multigroup analysis							
Constrained model	771.19**	27		.88	.78	.76	.18
Relaxed model	760.71**	24	10.48*	.88	.78	.73	.19
Subgroup analysis							
High traditionality	411.56**	12		.86	.78	.73	.20
Low traditionality	349.16**	12		.88	.78	.73	.18

\*  $p < .05$ .

\*\*  $p < .01$ .

females, and majors. Table 4 presents results of the multigroup CFA. In the constrained model, all three parameters ( $r_1$ ,  $r_2$ ,  $r_3$ ) were required to be the same across high and low traditionality groups. In the relaxed model, the three parameters were allowed to be different across the two groups. The change in model  $\chi^2$  between the constrained model ( $\chi^2 = 771.19$ ,  $df = 27$ ,  $p < .01$ ) and the relaxed model ( $\chi^2 = 760.71$ ,  $df = 24$ ,  $p < .01$ ) was significant ( $\chi^2 = 10.48$ ,  $df = 3$ ,  $p < .02$ ). This suggests that high and low traditionality groups differed significantly in their parameter estimates, indicating that the two groups may not fit the circumplex model equally well. As a follow-up of the multigroup analysis, we conducted separate CFA for each group. The results are shown in the last two rows of Table 4. While both samples did not fit the circumplex model, the fit indices were, as predicted, slightly better for the low traditionality group than for the high traditionality group as exhibited by the former having a smaller model  $\chi^2$  (349 vs 411), lower RMSEA (.18 vs .20), and higher GFI (.88 vs .86).

We further examined whether traditionality affects the fit of Hong Kong data to circular order model. We conducted the randomization tests for each group separately. For the high traditionality group, this test showed that 57 of 72 order predictions coincided with the circular order model with no ties ( $p < .02$ ), resulting in a correspondence index of .58. For the low traditionality group, the same test showed that 60 of 72 order predictions coincided with the circular order model with three ties ( $p < .02$ ), resulting in a correspondence index of .71. This pattern of results suggests that data from the low traditionality group fits Holland's circular order model better than data from the high traditionality group. These results, taken together, provide support for our cultural value hypothesis.

## DISCUSSION

In terms of the internal validity of Holland's model in Hong Kong, the results were somewhat mixed in support of the model. The internal consistency estimates of the vocational types with this sample were all in the acceptable range (alphas in the 80s). Further, the confirmatory factor analysis of the UNIACT

revealed very good fit indices which suggested that the six factor solution works well in Hong Kong. Nevertheless, further confirmatory factor analysis revealed that the Hong Kong data did not support the circumplex model of vocational interests as predicted by Holland ( $GFI = .88$ ,  $CFI = .78$ ,  $RMSEA = .19$ ).

Consistent with other similar studies, we also used the randomization test to evaluate the circular order relationships in Holland's model. For the current data set, the randomization test yielded a correspondence index of only .61 which is low in relation to the C-Index for U.S. samples. For example, Tracey, Watanabe, and Schneider (1997) found the C-Index to be around .92 for a U.S. sample. Interestingly, they found that the C-Index for their Japanese sample was .69 which is quite comparable to the current Hong Kong sample. Thus, it appears that there are some major limitations to Holland's structural model when applied to other cross-cultural samples. However, we also found that both the circumplex model and the circular order model are moderated by cultural variables such as traditionality-modernity of values.

To evaluate the external validity of Holland's model in Hong Kong, we developed two external criteria. The first was the self-reported job choice of the students which were coded according the Holland's classification system. When the correspondence between the students' measured choice on the UNIACT was compared to their expressed choice, the results indicated that Holland's model worked quite well for four of the six vocational types, namely Realistic, Investigative, Enterprising, and Conventional. However, the prediction of the Artistic and Social types were not significant and showed poor correspondence within Holland's model.

The lack of support for Artistic type is understandable because very few of our sample planned to choose artistic jobs. It should be pointed out that the study was conducted at a university of science and technology where there was a low distribution of Artistic types. The lack of support for Social type was more difficult to explain as 13% of the sample planned to choose social type occupations. A close examination of the data reveals that among the six types of careers, a social career is most popular for science majors (accounting for 41% of their choices), but relatively unpopular for business (5.2%) and engineering majors (6.1%). Among the science majors who chose social career, over 90% wanted to be a teacher. It is interesting to note that teachers are well paid in Hong Kong, and there is a strong demand for science and math teachers. These results suggest that science majors who wanted to pursue social careers do not do so because of their high Social interest but because of their concern for future jobs. This may be one possible explanation for this particular finding.

As a second criterion to examine the external validity of Holland's model, we investigated the relationship between the students' Holland codes and their academic majors. Consistent with our prediction, science majors scored significantly higher than engineering or business majors on Investigative interest, engineering majors scored significantly higher than science or business majors on Realistic interest, and business majors scored significantly higher on Social,

Enterprising, and Conventional interests than science or engineering students. These results support Holland's theory of careers as operationalized by UNIACT and as they apply to Hong Kong university students.

Given the mixed results of the current study, it appears that Holland's model has some potential for applications for the Chinese in Hong Kong but that some cultural accommodation may be needed. For example, vocational interest scales based on Holland's model may need to be modified to provide a better assessment of the Social type. In the UNIACT, the social scale did not work well for the Chinese sample. Chinese tend to be situationally oriented and emphasize mutual dependence (Hsu, 1981). The items within the Social scale need to be examined more closely and indigenous items may have to be added in the future to increase the equivalence of measurement and cultural validity of the assessment instrument.

Consistent with Leong's (1997) observation that cultural context variables are very important in the study of cross-cultural career psychology, we noted that the findings of the current study were moderated by a dominant cultural value dimension, namely traditionality-modernity. We examined the moderating effects of this cultural dimension in both the confirmatory factor analysis as well as the randomization test. In the former, we found that the circumplex model did not fit either group particularly well. However, the smaller model  $\chi^2$  along with lower RMSEA and higher GFI suggests that the fit is slightly better for the low traditionality group (preferring modern values) than the high traditionality group (preferring traditional values). When the possible moderating effects of this cultural dimension were explored in the randomization test, we found a similar pattern. The correspondence index for the low traditionality group was higher than for the high traditionality group (.71 vs .58). This also suggests that the data from the low traditionality group fit Holland's circular order model better than the high traditionality group.

Taken together, this pattern of findings suggests that the cultural value dimension of traditionality-modernity is very important in understanding the career psychology of the Chinese in Hong Kong. More specifically, the results are quite consistent with the vocational psychology literature on ethnic minorities in the United States. If we assume that the traditionality-modernity cultural variable is similar or parallel to the acculturation variable in the United States, then these results suggest that Chinese students who are low on traditionality (preferring modern values) are the ones for whom the Holland model fits better. On the other hand, Holland's model has a poorer fit to the Chinese students who are high on traditionality (preferring traditional Chinese values). This pattern of findings precisely parallels the acculturation variable as it applies to the vocational behavior of Asian Americans in the United States as formulated by Leong and Chou (1994). They had proposed that Western models of vocational psychology would be most relevant and appropriate to high acculturation Asian Americans, because they were most Westernized and most like the European Americans on which these models have been developed. In the same way, the current findings

also suggest that Holland's model seems to fit best for those who are most highly Westernized and similar to European Americans (low traditionality).

There are several cultural contextual factors which may relate to the lack of a perfect fit of Holland's model in Hong Kong samples. These factors are worth exploring as possible explanatory variables in future studies of vocational choice in Hong Kong. First, there is a strong materialistic value orientation among the people of Hong Kong (Redding, 1990) which may work against Holland's assumption that people look for jobs that they like or find interesting. Given this orientation, many people in Hong Kong may look for jobs with high pay and good future prospects even if they may not find them intrinsically interesting. Indeed, it may be possible that Holland's model may work well in affluent countries where individual interests and preferences are most likely to guide career choices. On the other hand, in many developing countries, where the citizens are located in the lower stages of Maslow's hierarchy of needs (i.e., more survival oriented than actualization oriented), career choices may be more guided by expediency and pragmatics.

A second factor mitigating the applicability of Holland's model in Hong Kong is the socioeconomic nature of Hong Kong's occupational structure. Hong Kong has a very competitive and entrepreneurial economy which in turn stimulates a high level of pragmatism in the job market (Redding, 1990). In general, there is a limited availability of certain kinds of occupations in Hong Kong due to the nature of the economy and a small domestic market. In addition, Hong Kong is switching from a manufacturing to service sector. Many high school and university students realize that it would be more and more difficult to find job in certain sectors. Therefore, many of them have chosen to enter the business field where the majority of the available and high paying jobs are located. High paying jobs in Hong Kong are quite important given the cost of living, the high inflation rates, and the rudimentary social security system. This in turn also promotes a highly materialistic orientation among the Hong Kong people as noted above.

With regards to artistic careers, the job opportunities for Artistic types are relatively rare and tend not to be highly rewarded. Persons who choose artistic careers, even if they become successful, cannot count on the high salaries usually provided to their counterparts in the United States. One illustration of the low value assigned to artistic occupations is the fact that there are not even academic majors in the artistic fields in most universities in Hong Kong.

Finally, there are several limitations of the current study which need to be kept in mind when interpreting the results of the study. One of the limitations is that the sample was taken from a science and technological university in which the student body consists of students majoring in science, engineering, and business management. Consequently, the sample lacked students whose primary personality type resemble those of Artistic type. A second limitation was that our sample consisted solely of freshmen during the orientation period. It is possible that more advanced students would have more clearly

formulated career plans and provide a different pattern of findings. Third, the traditionality measure of values used in the current study had an acceptable but low level of internal consistency ( $\alpha = .60$ ). Studies with other cultural value measures may be useful to cross-validate the current findings. Future studies should also examine the validity of Holland's model for a whole range of university students from freshmen to seniors and from returning students to graduate students. In addition, university students in Hong Kong, as in many countries, are the elite portion of society. Future studies of Holland's model in Hong Kong with community, nonuniversity samples seems highly indicated. In the West, educational attainment is usually highly correlated to occupational mobility and higher social class. If this same relationship holds in Hong Kong, it would be useful to have studies of vocational choice among both university and nonuniversity samples.

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