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BRIEF REPORTS

Holland in Iceland Revisited: An Emic Approach to Evaluating U.S. Vocational Interest Models

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An emic approach was used to test the structural validity and applicability of Holland's (1997) RIASEC (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) model in Iceland. Archival data from the development of the Icelandic Interest Inventory (Einarsdóttir & Rounds, 2007) were used in the present investigation. The data included an indigenous pool of occupations and work-task items representing Iceland's world of work that had been administered to a sample of 597 upper secondary school students. Multidimensional scaling analysis and property vector fitting using Prediger's (1981) work-task dimensions were applied to the item responses to test if the RIASEC model could be identified. The results indicated that a 4-dimensional solution better explains the interest space in Iceland than Holland's 2-dimensional RIASEC representation. The work-task dimension of People–Things and the Sex-Type and Prestige dimensions were located in the 1st and 2nd dimensions of the multidimensional scaling solution, but Data–Ideas, a dimension critical to the RIASEC model, was not. The 3rd and 4th dimensions did not correspond to any dimensions previously detected in structural studies in the United States and seem to be related to specific ecological, cultural, and political forces in Iceland. These results demonstrate the importance of selecting representative indigenous occupations and work tasks when evaluating the RIASEC model. The present study is an example of the next step in a comprehensive cross-cultural research program on vocational interests, an emic investigation.

Keywords: RIASEC model, vocational interests, cross-cultural, emic

Researchers and practitioners outside the United States have typically taken an etic approach to the assessment of vocational interests. Vocational interest measures based on Holland's (1997) theory of six vocational interest types (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional, or RIASEC) have been imported, translated, and adapted for practice in numerous countries. Central to the measurement of the RIASEC types is the hexagonal model (see Figure 1) used to represent the interrelations among the six interest types and six corresponding work environments. Research with a few exceptions (e.g., Šverko & Barbarović, 2006) has not supported the use of Holland's structural model in countries outside of the United States (Rounds & Tracey, 1996). Iceland is among the few countries where the applicability of Holland's model has been supported, using translated U.S. interest inventories (Einarsdóttir, Rounds, Ægisdóttir, & Gerstein, 2002). In spite of the support for Holland's structural model, the question still remains of how well the RIASEC model represents the interest structure of work in Iceland. The purpose of the present study is to take an emic approach and test the applicability of Holland's model in Iceland using occupations and work tasks that are representative of Iceland's vocational environment. The study has theoretical and practical implications for the cross-cultural application of interest models and measures where etic approaches have been previously used to support the RIASEC model.

Cross-Cultural Validity of Vocational Interests

In cross-cultural psychology a distinction is made between etic and emic strategies in research and practice. The main difference is that etic approaches typically involve the importation and adaptation of models and measures developed in one culture to another culture, but emic studies focus on identifying indigenous constructs (e.g., Ægisdóttir, Gerstein, Leung, Kwan, & Lonner, 2009; Church & Lonner, 1998). U.S. interest measures have been directly translated and the items have been adapted for use in Iceland (e.g., Scheving-Thorsteinsson, 2009). Etic methods of translation and adaptation are commonly used when measures are applied in other countries than the original (van de Vijver & Poortinga, 2005). The construct equivalence or the validity of the theory in the new culture is often taken for granted, and this approach is more accurately labeled as an *imposed etic* (Berry, 1989; Church & Lonner, 1998). Van de Vijver and Poortinga (2005) have discussed an emic strategy of assembling a measure in the new culture. The emic strategy, for example, has been

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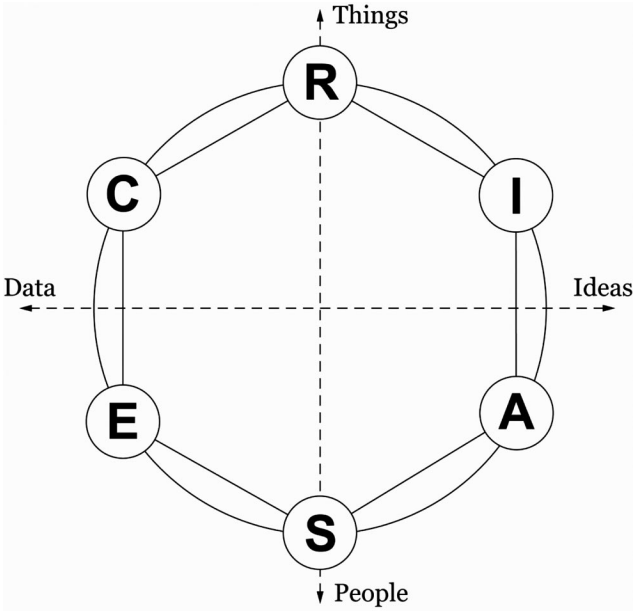

Figure 1. Holland's (1997) model and Prediger's (1981) dimensions. R = Realistic; I = Investigative; A = Artistic; S = Social; E = Enterprising; C = Conventional.

applied to study the robustness and universality of the Big Five personality traits. Researchers have used indigenous personality terms to test the Big Five in several nations, finding that alternative dimensions emerged to complement the Big Five (Heine & Buchtel, 2009). The emic approach is rarely used in vocational interest measurement but it has an advantage over the imposed etic because it allows for the study of the culture-specific aspects of the constructs being measured.

Despite the etic support for Holland's (1997) model in Iceland (Einarsdóttir et al., 2002), the validity of the model needs to be subjected to wider testing. U.S. measures that have been designed to assess RIASEC constructs may not capture culturally specific, Icelandic vocational interests. The United States and Iceland show differences in the distribution of labor, for example, with a higher proportion of the U.S. work force in wholesale and trade and a higher proportion of the Icelandic work force in manufacturing, fishing, and farming (Hagstofa Íslands, 2009; U.S. Department of Labor, 2009). Occupations develop in a cultural context and are influenced by historical, political, and ecological factors. In Iceland, geography has largely shaped work and the kinds of occupations available. Iceland is a relatively large island situated in the north Atlantic with a small, ethnic population of 300,000. Nature is harsh, the weather unpredictable, and the growing season short. Economic development was delayed in Iceland compared to that in most other Western nations. In the 1940s, half of the population worked in agriculture (raising sheep and cattle) and fishing. Fishing has been the largest source of income for the nation and the country is also rich in other natural resources especially hydro- and geothermal energy, making the standard of living in Iceland among the highest in the world (Ministry for Foreign Affairs, n.d.). In the present article we assume that work force differences among countries influence how occupations and work tasks are perceived. At the very least, interest measures should include the kinds of occupations and work tasks that encompass the majority of citizens. A necessary step in an emic approach is the development of an indigenous item pool that reflects the world of work in Iceland and that does not restrict the range of occupations and work tasks.

Einarsdóttir and Rounds (2007) developed the Icelandic RIASEC scales. These scales have structural properties that mirror Holland's hexagonal model and show sufficient internal consistency reliability for practical applications. Nevertheless, the method of constructing the RIASEC scales involved imposing Holland's RIASEC model on a representative sample of indigenous items, a constrained emic strategy, choosing only those items that show the circular pattern of RIASEC types. Unfortunately, after applying these structural constraints, only a small number of indigenous items (38%) were selected to represent the Icelandic world of work. The present article removes the RIASEC structural constraints and evaluates Holland's model using the full Icelandic domain of occupations and work tasks.

Dimensional Representation of RIASEC Interests

To test how well Holland's (1997) model represents Icelandic interests, Prediger's (1981) RIASEC work-task dimensions of People–Things and Data–Ideas were used to locate the RIASEC types in the spatial solutions. Prediger proposed that two bipolar work-task dimensions of Data–Ideas and People–Things account for the RIASEC circular model (see Figure 1). The People–Things dimension reflects preferences for working either in interaction with people (e.g., teaching, helping, etc.) versus working with inanimate objects (e.g., building, repairing, producing, etc.). The Data pole of the Data–Ideas dimension intersects the midpoint between the Enterprising and Conventional types, reflecting preferences for working with structured information. The Ideas pole is related to both Holland's Artistic and Investigative types, reflecting preferences for expressing and creating ideas.

Additionally, the dimensions of Prestige or Sex Type have also been identified in item-level analyses (e.g., Einarsdóttir & Rounds, 2000; Tracey & Rounds, 1996). Prestige refers to status and is related to the complexity of work, with higher prestige occupations requiring more education and resulting in better compensation and control (Tracey & Rounds, 1996). Sex Type reflects the gendered stereotyping of occupations and work tasks and is related to the proportion of men versus women in occupations (White, Kruczek, Brown, & White, 1989).

The Present Study

In the present study, we used an emic approach with an indigenous item pool not restricted in range by a priori constructs that reflects the full range of work in Iceland. The emic strategy allows exploration of culture-specific features of vocational interests and provides better insight into the meaning of Icelanders' responses to interest items. Participants were drawn from archival data collected in the development of the Icelandic Interest Inventory (III; in Icelandic, Bendill; Einarsdóttir & Rounds, 2007).

A variety of analyses, similar to the methodology in Deng, Armstrong, and Rounds (2007), were used to test the RIASEC structure. We began the analyses by evaluating Holland's (1997) RIASEC model in two dimensions. Our results showed that addi-

tional dimensions were required to map the indigenous interest items. Therefore, two to five dimensions were examined using multidimensional scaling (MDS). We then fitted Prediger's (1981) RIASEC work-task dimensions of People–Things and Data–Ideas to the spatial solutions to test how well Holland's model represented the interest space. To assist in the interpretation of the additional Icelandic dimensions, we also used prestige and sex-type markers that have been found to map onto the RIASEC interest space.

Method

Participants

The sample consisted of 597 students who were 18 years and older (323 women and 274 men), with a mean age of 20.6 years (SD = 4.7). Due to developmental issues only students 18 years and older were selected for this study from a sample of 1,043 upper secondary students that participated in the development of the III (Einarsdóttir & Rounds, 2007). In Iceland, a large majority of young people (about 90%) enter 2- to 4-year vocational tracks or academic education at upper secondary schools (gymnasiums, comprehensive schools, or vocational schools) after finishing their compulsory schooling at age 15–16 and before being eligible to apply to universities. Fifteen schools were contacted for participation, and care was taken to select schools that would together fully represent all possible educational opportunities offered in the upper secondary school system. Eleven schools distributed across the country participated in the study.

Indigenous Interest Items

The indigenous item pool consisted of 125 occupations (e.g., play school [preschool] director, accountant, and fisherman) and 133 work tasks (e.g., assist students with physical abilities in school, shell and clean shrimp, write a computer program). The occupations and the work tasks were developed from the Icelandic job market occupational classification (Hagstofa Íslands, 1994), published job descriptions (Óskarsdóttir, 1990, 1996, 2001; Samtök Iðnaðarins, n.d.), and job descriptions elicited from various companies. The Icelandic occupational classification system is made up of around 1,800 occupational titles that are categorized into 380 occupational groups. We selected occupations and work tasks from as many of the 380 occupational groups as possible. Another major aim was to have the items represent occupations that cover approximately 80%–85% of jobs people have in Iceland. Participants responded to the 258 items on a 5-point scale (1 = *strongly dislike*, 2 = *dislike*, 3 = *indifferent*, 4 = *like*, and 5 = *strongly like*).

Assignment of RIASEC codes and Data–Ideas and People–Things scores. Three Icelandic career counselors, who had a thorough understanding of Holland's (1997) theory and years of experiences using RIASEC measures, rated the occupations and work tasks according to how well each item was characterized by the RIASEC types (e.g., the item *electrical engineer* was assigned the three-letter code of IRC). The interrater reliability of the ratings, estimated using gamma (Goodman & Kruskal, 1954), was .60 for the work-task items and .56 for the occupations. These reliabilities are moderate compared to the assignment of RIASEC codes to U.S. occupations (Rounds, Smith, Hubert, Lewis, & Rivkin, 1999). The first author, who has an extensive knowledge of the Icelandic job market and Holland's theory, reviewed the ratings and resolved disagreements among the raters. Data–Ideas and People–Things scores were calculated for each item using their three-letter RIASEC codes and Prediger's (1981, p. 24) algorithm.

Sex-type and prestige ratings. To assist in the interpretation of the MDS spatial solution, indicators of sex type and prestige were developed. Subjective ratings have been shown to agree with more "objective" measures such as government data on percentage of men and women in occupations for sex type and education for prestige (Cooper, Doverspike, & Barrett, 1985). Recently, mean differences in interest responses between men and women have been shown to correlate highly with objective sex-type ratings (Deng et al., 2007). Because there are no data available in Iceland on the sex composition of specific occupations, the mean differences between female and male interest items were calculated as an indicator of sex type. Objective measures of prestige also do not exist in Iceland. Therefore, three labor market experts (graduate students or Ph.Ds in the field) who had extensive knowledge of occupations' education level, salaries, and so forth and have also spent most of their lives living in Iceland rated the items on prestige (in Icelandic, *virðingarstaða*). A 7-point rating scale (1 = *not at all prestigious* to 7 = *very prestigious*) was used. The interrater mean reliability of the prestige ratings was .76 using Spearman's rank-order correlation.

Procedure

Administrators and career counselors in schools selected to participate were contacted. The counselors were asked to select groups of students (classes in most cases) and to administer the III through the project website. Approximately 98% of the students agreed to participate and they responded to all of the items in the inventory. The students signed an informed consent before responding to the inventory.

Results

Several methods were used to evaluate the structural properties of vocational interests in Iceland and to test how well Holland's (1997) RIASEC model accounts for responses to indigenous vocational interest items. MDS was first applied to test the dimensionality of the Icelandic interest responses. MDS has typically been used to evaluate the circular RIASEC structure (e.g., Rounds & Day, 1999). Then, RIASEC scales were constructed to test whether Holland's model could be identified in the two-dimensional Icelandic interest space. Property vectors (Kruskal & Wish, 1978) using Prediger's (1981) RIASEC work-task dimensions of People–Things and Data–Ideas were regressed onto the MDS spatial solutions in two through four dimensions to test how well Holland's model represented the interest space and to assist interpretation. We also fitted the dimensions of Sex Type and Prestige to better understand the MDS solutions.

Dimensional Structure of Icelandic Interest Items

It is important to rule out gender differences in the RIASEC model in Iceland. Therefore, a three-way MDS, which is an indi-

vidual difference scaling (Arabie, Carroll, & DeSarbo, 1987), was applied to the male and female item correlation matrices across occupations and work tasks. Because both occupations and work-task items were used to represent the Icelandic world of work, we evaluated the generalizability of dimensional structure across different item types. The male and female correlation matrices were submitted to three-way scaling analysis, extracting two to five dimensions.

Table 1 shows the stress, variance accounted for (VAF), and dimensional weights for the two-, three-, and four-dimensional solutions by gender for the work-task items and occupations combined. The results indicate that a three- or four-dimensional solution across sex and item type better explains the interest space in Iceland than a two-dimensional solution. The proportion of VAF (an indicator of fit for the MDS solution) increased by 4%–20% from the two- to the three-dimensional solution, approximately 7% from the three- to the four-dimensional solution, and 5% from the four- to the five-dimensional solution. The five-dimensional solution compared to the four-dimensional solution explained minimal additional variance. The relatively small differences in salience weights and comparable stress values and VAF across gender indicate that the two- to four-dimensional solutions fitted the data similarly for both men and women. Therefore, the combined gender solutions were chosen for further analysis. Similarly, no major differences emerged in the three analyses for work tasks and occupations. Work tasks and occupations together give the most complete representation of the Icelandic world of work and were, therefore, used in combination in the analyses.

Description of Icelandic Interest Space

We plotted the RIASEC-coded items along with the centroid coordinates for the RIASEC types to test if Holland's model could be fitted in two-dimensional space. Centroids were calculated by averaging the item coordinates for each RIASEC type. Figure 2 shows the two-dimensional configuration of the coded items and the RIASEC centroids. Holland's (1997) model is not well represented in two-dimensional Icelandic interest space. The R, S, A, and E type items form rather clear but not discrete clusters, and the C and I items are scattered over the spatial solution. The RIASEC centroids are not ordered according to Holland's structural hypothesis with the S type next to the R and A adjacent to E, resulting in a RICEAS order of types.

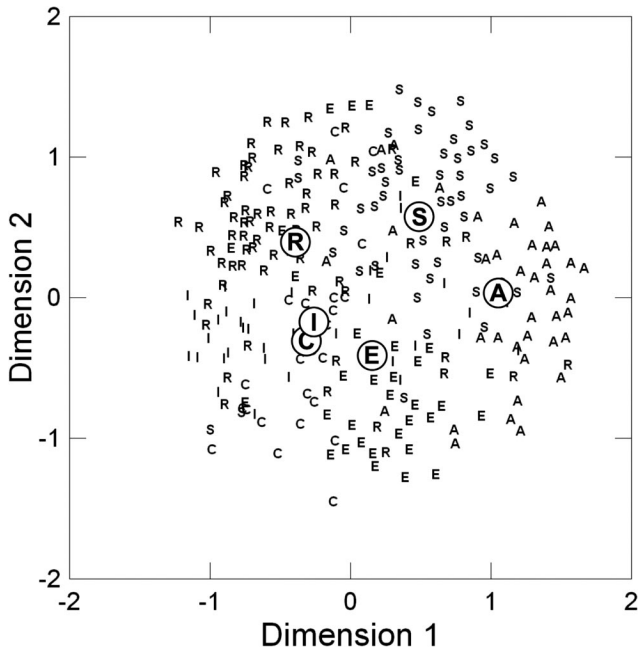

Figure 2. Two-dimensional multidimensional scaling (MDS) configuration of occupations and work tasks with centroids plotted for RIASEC types. R = Realistic; I = Investigative; A = Artistic; S = Social; E = Enterprising; C = Conventional.

The four property vectors (People–Things, Data–Ideas, Sex Type, and Prestige) were fitted into the two- to four-dimensional space by regressing each property vector onto the coordinates of the three-way MDS solution. Table 2 shows the squared multiple *R*s for the property vectors in two-, three-, and four-dimensional interest space. The regression results show that the People–Things property vector fits well in all solutions, with R^2 higher than .50. Sex Type and Prestige showed a good fit in the three- and four-dimensional solutions. Data–Ideas was not well represented in either the two- or three-dimensional solution. Only in the four-dimensional solution did Data–Ideas account for over 50% of the variability (see Table 2).

Table 1
Three-Way MDS Fit Indices and Salience Weights for Two- to Four-Dimensional Solutions by Gender for 258 Work Tasks and Occupations

Solution	Stress	VAF	Salience weight			
			Dim 1	Dim 2	Dim 3	Dim 4
Two-dimensional						
Women	.30	.50	.72	.62		—
Men	.33	.38	.63	.70	—	—
Combined	.32	.44	—	—	—	—
Three-dimensional						
Women	.23	.54	.59	.54	.55	—
Men	.22	.58	.49	.53	.65	—
Combined	.23	.56	—	—	—	—
Four-dimensional						
Women	.19	.60	.52	.49	.51	.45
Men	.17	.69	.42	.48	.55	.52
Combined	.18	.64	—	—	—	—

Note. MDS = multidimensional scaling; VAF = variance accounted for; Dim = dimension.

Table 2
Variance Accounted for Property Vector Fitting Analysis of Four Interest Variables

MDS solution	Interest variable			
	People–Things	Data–Ideas	Sex type	Prestige
Two-dimensional	.53	.11	.44	.44
Three-dimensional	.58	.36	.60	.50
Four-dimensional	.65	.53	.63	.70

Note. MDS = multidimensional scaling.

An inspection of the coordinates of the four-dimensional solution supports the interpretation of the first dimension as a People–Things and Sex-Type dimension. On one end are the A- and S-coded items, mostly female sex typed (e.g., sing in a band or chorus, teach children), and at the other end are mostly R-coded items, male sex typed (e.g., delivery truck driver, repair fishing nets), and a few I-coded items (e.g., mechanical and electrical engineers). The second dimension contains at one end a mixture of A-, E-, C-, and R-coded items that are high on prestige (e.g., architect, establish and run own business, computer programmer, pilot). At the opposite end are low-prestige, mostly R- and S-coded items along with a few A-coded items (e.g., garden worker, nursing home attendant, floral designer).

The third dimension has on one end mostly business-related E-coded items (e.g., bank and business manager, attorney) and a few C-coded items (e.g., review accounts for companies, give customers information on the status of their investments); on the other end of the dimension is a mixture of R-coded items that have connection to nature (e.g., farmer, cultivate plants and plant trees, ranger) and A-coded items (e.g., painter, custom designer, teach to play musical instrument). However, the A-coded items tended to load on other dimensions too. We speculate that this dimension reflects two opposite values that have been in contradiction within Icelandic culture and politics. On the one hand are views that put economic development or financial gains above all and support the extensive use of available natural resources (e.g., damming rivers and harnessing geothermal energy) to create power plants for big multinational industries (e.g., aluminum smelters). The other view emphasizes the conservation of nature above all, resulting in more basic lifestyles in harmony with the harsh natural elements that have traditionally been presumed to play a large role in shaping the culture (e.g., Jónsson, 2007). The fourth dimension has I-coded items that are high-prestige natural science items (e.g., biologist, physician, analyze chemicals in a laboratory) on one end and low-prestige service and retail items on the other end (with mixed codes of S, C, E, and some R; e.g., assist customers in choosing clothes, bake breads or cakes, serve food and drinks to passengers during a flight).

Discussion

Holland's (1997) RIASEC model showed a poor fit to the Icelandic interest space. The RIASEC work-task dimension of People–Things was identified in the two- and three-dimensional spaces, but the work-task dimension of Data–Ideas was not. These results differ from Deng et al.'s (2007) study in the United States where Holland's RIASEC types were found to be embedded in a three-dimensional space. Both Sex-Type and Prestige dimensions were clearly identified and play a larger role in the interest responses of Icelandic students than U.S. students. The emic approach in the present study was needed to fully test the applicability of Holland's theory of interest structure in Icelandic culture. This strategy shows that a four-dimensional model best reflects the Icelandic interest landscape.

The first interest dimension was identified as work-task dimension of People–Things and Sex Type. Sex Type has been found to be highly correlated with People–Things, a dimension that shows large gender differences in the United States (Su, Rounds, & Armstrong, 2009). Prestige emerged as the second dimension in Iceland, but Data–Ideas, as typically found in U.S. research (e.g., Deng et al., 2007), did not. The third dimension seems to represent interests in persuasion and financial gains (Holland's Enterprising type) versus nature. This interpretation does not seem to correspond to any dimensions previously detected in structural studies in the United States and may be related to specific ecological, cultural, and political forces in Iceland. The fourth dimension contained natural science items at one end of the dimension and service and retail items at the other end. This dimension seems to reflect interest in problem solving in the natural science versus people-oriented service in business. Holland's (1997) Investigative versus Enterprising dimension is similar, with the exception that Investigative interests were narrowed to natural science and enterprising to retail service. The separation of the natural sciences from the broad domain of science is similar to results found in a study of occupational perceptions conducted in Israel, where Amit and Sagiv (2009) showed that people tend to perceive Investigative occupations mainly in terms of their content but not their commonalities.

The most striking results were that Prediger's (1981) Data–Ideas dimension does not apply in Iceland. In the two-dimensional spatial solution, Investigative and Conventional interests were found to be interrelated and opposite to Artistic interests. Typically, in U.S. studies the Investigative interests are related to Artistic interests and not related to Conventional interests. The Icelandic students may have been responding to the structured information in the Investigative interests and the common emphasis on details and data in Conventional and Investigative occupations.

For practical applications, the four-dimensional spatial solution identified in the Icelandic data is unwieldy and possibly difficult to link to occupations. In comparison, Holland's (1997) two-dimensional model is more parsimonious and easier to link to occupations but is not representative of most Icelandic occupations and work tasks. The four-dimensional model and Holland's two-dimensional model present a dilemma—neither are acceptable for practice. A third structural approach to the Icelandic data would be to create a factor model or basic interest scales. Basic interest scales group together occupations and work activities that share a context, a setting, objects of interest, or processes (Day & Rounds, 1997). These scales can be linked to occupations either rationally or empirically and make immediate sense to clients (e.g., writing, teaching, office practices).

Cross-cultural research on Holland's (1997) interest model with a few exceptions has shown that the RIASEC model poorly fits international data (Rounds & Tracey, 1996). More recently, structural meta-analyses have not supported Holland's model in China (Liu & Rounds, 2003; Long & Tracey, 2006), but reasonable fit was found in another study in Hong Kong (Yang, Stokes, & Hui, 2004); the RIASEC model was partly supported in Germany (Nagy, Trautwein, & Lüdtke, 2010) and fitted well in Croatia (Šverko & Barbarović, 2006) and Serbia (Hedrich, 2008). Researchers may want to reconsider the imposed etic strategy commonly applied to interest assessment. In comparison, an emic approach offers a distinct advantage. By sampling indigenous occupations and work tasks, the structural results, if Holland's model is not supported, can lead to an alternative interest model. In either case, support for the RIASEC model or an alternative

interest model will generate new knowledge about the cross-cultural structure of interests.

A limitation of the present study is the imposition of U.S. dimensions (e.g., Data–Ideas) on the indigenous spatial model. From a strict emic approach researchers should develop culturally specific dimensions rather than rely on U.S. dimensions. In the present case, the U.S. dimensions were required to evaluate the RIASEC model. The dimensional results indicate that a factor model rather than a spatial model may better represent the Icelandic interest responses. Further study of the vocational interest dimensions is needed to gain a better understanding of the meaning of Icelandic interest responses. The sample studied is representative of the Icelandic, upper secondary student population 18 and older, but it is impossible to rule out that Holland's (1997) model was not detected due to Icelandic students' vocational development. By evaluating Holland's model and Prediger's (1981) dimensions in older samples of university students, we can further add to the knowledge of Icelandic interest models.

The present study demonstrates that it is important to have a representative sample of occupations and work tasks when developing indigenous models. Emic strategies allow researchers to explore both the commonalities and differences across cultures and to explicitly test the inherent assumptions of construct equivalence and universality. Emic studies open up the possibility of developing interest theories and models that can accommodate both common and specific features in each country or culture and, therefore, maximize the ecological validity (e.g., van de Vijver & Poortinga, 2005) of vocational interest measures. Using Berry's (1989) conception, the present study is an example of the next step in a comprehensive cross-cultural research program on vocational interests, an emic investigation to discover culture-specific aspects.

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