Study and Analysis of the Position Classification Inventory (PCI) by Gottfredson and Holland

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ABSTRACT

Introduction. Holland's theory, along with Gottfredson and Holland's professional analysis work, have produced the PCI (Position Classification Inventory), a simple method for classifying any occupation in accordance with Holland's Typology theory. The purpose of our study is to perform an analysis of a Spanish translation of the Position Classification Inventory (PCI) in order to check its psychometric properties in a Spanish sample.

Method. We prepared a translation of the PCI which was applied to a sample of 525 subjects pertaining to 78 different occupations. We calculated the reliability of each of the six scales that the instrument measures, relating to the six types of environmental models proposed by Holland (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) and we performed an item analysis in order to verify to what extent each item is representative of its scale.

Results. Reliability indices range from 0.65 to 0.85. The Investigative, Social Enterprising and Conventional scales obtain reliability indices below 0.80. The item analysis allowed us to detect 42.3% of items that do not meet established criteria, and therefore are not considered discriminative for the scales they belong to.

Discussion. We feel it necessary to adapt the PCI, substituting the items with less discriminating power for their scales, in order to get a more precise instrument where the scales have greater reliability indices. At the same time, we suggest that new studies be carried out using different samples in order to verify the instrument's reliability.

KEYWORDS: occupation classification, Holland theory, environmental models, PCI

INTRODUCTION

Throughout history there have been numerous attempts at classifying occupations. We can look back to 1909, the year when Frank Parsons, in his work *Choosing a Vocation*, presents an occupational classification with the purpose of understanding the work world more rationally. Since this point in time a multitude of classifications have been created, and once vocational guidance services were established, these have been used to facilitate counsel and exploration of the work world by means of diverse procedures.

The classification systems make it possible to order occupational information according to preestablished criteria. These serve a twofold purpose: for uniform treatment of occupational statistical data, identifying occupations in supply or demand in the job market; and as a source of information for use in giving advice and vocational/professional guidance.

Herr and Cramer (1996, p. 52) indicate as many as 13 criteria that have been used for classifying occupations: by companies or setting where the work is performed; by socioeconomic groups; by skills or aptitudes, by interests, by field and level (Roe, 1956); by field, level or work environment (Super, 1962); by the type of work, by income, by educational and occupational requirements, by the occupational tasks that must be accomplished; by life history, by incentives and by age (Kaufman and Spilerman, 1982).

Rodríguez (1998, pp. 201-206) distinguishes two classification systems, the one-dimensional and the two-dimensional. In the one-dimensional type he mentions the Census Classification (dividing the work world into white collar workers, blue collar workers, agricultural workers and service workers), socioeconomic systems of occupational classification and systems based on prestige (salary level, educational level, power and influence exercised, etc.). The two-dimensional systems classify occupations by taking into account two dimensions: horizontally they take into account the type of work, and vertically they consider aptitude or required skill, the level of responsibility or educational level required. As examples of this dimensional type he mentions the Roe system, the Dictionary of Occupational Types (DOT) and the American College Testing Program (ACT).

For their part, Rocabert, Martínez and Rivas (1990) consider existing classifications that focus on people's vocational preferences and interests. These authors distinguish the

following types of classifications: occupation centered (Super, 1962); focused on prestige and socioeconomic level (Hodge, Siegel and Rossi, 1966; Edwards, 1943; Hatt, 1950); based on work content; and according to the worker's characteristics (Roe, 1956; Holland, 1973; Knapp and Knapp, 1984).

From the previously mentioned classification systems, we can also make out classification systems by "author" as compared to "institutional" classification systems (Corominas, 1989). The difference lies in that the former performs its classification in terms of the theoretical lines identified by an author; while in the latter, the classification is developed by an institution with a practical labor management purpose.

The study we undertake here is based on the classification system of professional environments per Holland's typological theory (1997). This theory about vocational choice, briefly, stems from the possibility of characterizing people by their similarity to six personality types (Realistic, Investigative, Artistic, Social, Enterprising and Conventional). Each one of these types represents a summary of what we know of people who make up a certain professional group. The more one is similar to a certain type, the more he or she will manifest personal traits and behaviors associated with this type. Just as six personality types exist, Holland suggests the existence of six environmental models representing the situation or atmosphere created by the people who predominate in a certain environment. Additionally he supposes that the interaction of people and environments leads to consequences that can be predicted and understood on the basis of existing knowledge about personality types and environmental models. These conclusions include vocational choice, vocational stability and achievement, personal competence, social behavior and susceptibility to influence.

Holland assigns a dominant role in vocational behavior to the environment, inasmuch as this exercises a clear influence on the people who inhabit it. On the other hand, he indicates that in the same way as people are evaluated by comparing them to personality types, one can also evaluate environments comparing them to environmental models, that is, with the descriptions of hypothetical environmental models (Holland, 1997). The environmental models, briefly, have the following characteristics:

- Realistic. Presents environmental demands and opportunities that involve explicit, ordered and systematic manipulation of objects, tools, machines and animals.

- Investigative. Presents demands and opportunities that involve observation and creative, symbolic and systematic investigation of physical, biological or cultural phenomena.
- Artistic. Presents demands and opportunities that involve ambiguous, free and non-systematic activities and competencies, in order to create artistic forms or products.
- Social. Presents environmental demands and opportunities that involve the manipulation of other people in order to train them, take care of them and instruct them.
- Enterprising. Presents demands and opportunities that involve manipulation of others in order to reach organizational objectives or objectives of one's own interest.
- Conventional. Presents environmental demands and opportunities that involve explicit, ordered and systematic manipulation of data, record maintenance, material archiving, material reproduction, organization of documents, papers and numeric data in accordance with a prescribed plan, and working with machines and administrative data.

One of the first procedures for defining the professional environment was the Environmental Assessment Technique (EAT) (Astin and Holland, 1961). This technique, quite simple in its basis, consisted in developing a census of occupations in a town along with their professional/study/vocational preferences classified according to the personality types of its members. For this purpose Holland's Vocational Preferences Inventory was initially used (Holland, 1965).

In order to increase the classification of professions, data was used from the Strong Vocational Interest Bank (SVIB) by Campbell (1971), Kuder (1977), the SCII (Strong Campbell Interest Inventory) by Campbell (1977) and the SDS (Self-Directed Search) by Holland (1994a, 1994b, 1994c).

The first edition of the DHOC (Dictionary of Holland Occupational Codes) by Gottfredson and Holland (1989, 1996) appeared in 1982. This classifies, according to Holland's typology, 12860 occupations in the United States as reflected in the DOT (Dictionary of Occupational Titles). Notwithstanding, Gottfredson and Holland (1991b)

consider it desirable to improve the DHOC classification, since the instrument on which it is based, the DOT, does not offer a uniform classification; some similar occupations are found in different categories, or there are occupations which encompass others. Furthermore there are occupations that are not explicitly classified.

On the other hand, they indicate that though the DHOC provides a way to classify the majority of occupations, it provides no method to directly evaluate any position according to the theory and environmental typology. They consider, therefore, that it is not a tool for classifying a new occupation through evaluating an environment or examining the homogeneity or heterogeneity of the specific occupation. In order to illustrate these points, they comment that the DHOC does not contain any method for determining if a geologist working in environmental health in the state of Maryland is employed in a similar position to a geologist who works at an oil well in Oklahoma. They conclude by stating that an empirical method for evaluating occupations is needed. One possibility for solving this problem could have been utilization of existing instruments for work analysis, but all available previous methods were inappropriate for classifying professional environments according to Holland's classification. Thus there was no alternative but to develop a work analysis instrument linked to this theory.

The theory (Holland, 1965), together with research in professional analysis (Gottfredson and Holland, 1989), have produced the PCI (Position Classification Inventory): a simple method to classify any occupation per the Holland typology.

Having said thus, our current intention is to perform an analysis of psychometric properties of a Spanish translation of the PCI (Gottfredson and Holland, 1991a), in order to verify its goodness as a measure and to determine its level of applicability in classifying occupations per Holland's theory in the context of Spain.

METHOD

Subjects

Our sample is made up of 525 subjects from the province of Almeria who either work in the occupation indicated or have sufficient qualifications to do so. Taking gender into

account, the PCI was completed by a total of 337 women, representing 64.2% of the total, and 188 men, representing the remaining 35.8 %.

Ages fall between 18 and 60 years, the average age being 30.2 years and the standard deviation 8.7 years, the mode is 23 years and the mean 27.

Table 1. Sample distribution by age and sex (%)

AGES	MEN	WOMEN	TOTAL
18-22	2.7	13.3	16.0
23-27	12.2	23.0	35.2
28-32	6.1	9.7	15.8
33-37	5.0	7.6	12.6
38-42	3.8	3.8	7.6
43-47	2.7	4.8	7.4
48 and over	3.4	1.9	5.3
Total	35.8	64.2	100.0

Of the 525 subjects who completed the questionnaire, 82.9% work in the occupation indicated, while the remaining 17.1% are not working. 90% of the men say they are working, as do 80% of the women.

As to type of occupation held by the subjects, most of the 78 occupations reported belong to the services sector. The distribution of occupations is as follows:

Table 2. Distribution of Occupations

OCCUPATION	Fr
ATTORNEY	15
ADMINISTRATIVE WORKER	7
FARMER	1
BANK ANALYST	1
FINANCIAL CONSULTANT	2
LABOR CONSULTANT	2
CLINICAL ASSISTANT	1
FLIGHT ATTENDANT	1
WAITER/WAITRESS	9
COOK	6
SALESMAN	1
COMMUNICATOR	1
ACCOUNTANT	3
CONTROLLER	1
SALES CLERK	15
HOTEL DIRECTOR	1
DOCUMENT MANAGER	1
BANK EMPLOYEE	3
ATTENDANT	12
SURVEY TAKER	9
NURSE	39
PHARMACIST	1
SPANISH LINGUIST	10
PROSECUTOR	1
PHYSIOTHERAPIST	3
MANAGER	3
ENGRAVER	1
SPECIALIST IN SOCIAL WORK	10
AGRICULTURAL ENGINEER	11
RESEARCHER	1
CHEMICAL LABORATORY	3
SPECIALIST IN HUMANITIES	10
CLEANING AND MAINTENANCE	4
ADULT EDUCATION TEACHER	9
SPECIAL EDUCATION TEACHER	10
PHYSICAL EDUCATION TEACHER	13
PRESCHOOL TEACHER	11
PRIMARY SCHOOL TEACHER: FOREIGN LANGUAGE	16
PRIMARY SCHOOL TEACHER: MUSIC	10
PRIMARY SCHOOL TEACHER: GENERAL	13
RESIDENT ASSISTANT	1
GUIDANCE COUNSELOR	4
JOURNALIST	2

SECONDARY SCHOOL TEACHER: COMMUNICATION AND IMAGE	1
SECONDARY SCHOOL TEACHER: PHILOSOPHY	1
SECONDARY SCHOOL TEACHER: OCCUPATIONAL TRAINING	2
SECONDARY SCHOOL TEACHER: FOREIGN LANGUAGE	44
SECONDARY SCHOOL TEACHER: GENERAL	24
SECONDARY SCHOOL TEACHER: DRAFTING	2
SECONDARY SCHOOL TEACHER: GEOGRAPHY AND HISTORY	3
SECONDARY SCHOOL TEACHER: SPANISH LANG. & LITERATURE	30
SECONDARY SCHOOL TEACHER: MATHEMATICS	2
SECONDARY SCHOOL TEACHER: CHEMISTRY	38
SECONDARY SCHOOL TEACHER: TECHNOLOGY	4
UNIVERSITY PROFESSOR	4
PSYCHOLOGIST	14
CLINICAL PSYCHOLOGIST	10
EDUCATIONAL PSYCHOLOGIST	10
EXPERIMENTAL PSYCHOLOGIST	10
SOCIAL PSYCHOLOGIST	12
SPECIALIST IN PEDAGOGIC PSYCHOLOGY	12
CREATIVE ADVERTISING	1
CHEMIST	1
ADVERTISING DELIVERY	2
SECRETARY TO JUSTICE OF THE PEACE	1
X-RAY TECHNICIAN	1
STRATEGIC PLANNING EXPERT	1
SOCIAL WORKER	12
TRANSLATOR/INTERPRETER	2
TOURISM	1

Materials

We used a Spanish translation of the Position Classification Inventory (PCI) by Gottfredson and Holland (1991a) in order to perform the current preliminary study.

The PCI is an inventory created in order to provide a valid, economical way to classify any job, profession or occupation according to Holland's typological theory, taking into account the types or models of work environments (Holland, 1992, 1997). It is used to construct a profile of each occupation derived from six scales: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. In order to classify a specific occupation one uses the inventory answers given by employees who work in that profession and/or supervisors or occupational analysts.

The most important use of the PCI, therefore, is classifying occupations and professions according to the Holland typology, although it can also be used by companies and organizations, schools, universities, and employment and placement agencies for their purposes of planning and counsel. It can also provide an understanding of sources of insatisfaction in a person's job.

The PCI is made up of a notebook and an answer sheet. The PCI items are presented in a four-page notebook which provides instructions to complete the inventory. It comprises a total of 84 items spread among the six scales (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) such that each scale is formed of 13 items, and leaving 6 items unscored, since for Gottfredson and Holland (1991b) these have an experimental nature. The items are distributed according to 7 questions formulated in the inventory such that for each question two items of each scale are offered. (14 items in total). The questions formulated are as follows:

1. What does a person in this occupation or position have to do?
2. What skills, abilities or personal characteristics must be practiced or used in this occupation or position?
3. What type of attitude or perspective is required of a person in this occupation or position?
4. What styles or personal values can be expressed (or what needs can be met) by a person in this occupation or position?
5. What personal characteristics are required or demanded of a person in this occupation or position?
6. What abilities, skills or gifts does a person in this occupation or position need?
7. How often does a person in this occupation or position engage in or participate in the following activities?

Time allowed is usually 10 minutes or less, not requiring any special instruction or monitoring on the part of the administrator.

Procedure

As stated earlier, the objective of the current study consists in demonstrating the psychometric properties of the Position Classification Inventory (PCI) by Gottfredson and Holland (1991a) in order to apply it to the Spanish population. For this purpose a translation was carried out, incorporating translations performed by two experts in English philology and comparing them with our own, until we reached a final version.

Once the translation was applied to our selected sample, we performed an analysis of is psychometric properties consisting of:

a) Calculating the internal consistencies of the scales that make up the inventory in order to determine its reliability. The consistency index of each of the scales (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) was obtained by calculating the Alpha (α) coefficient.

b) Performing an analysis of the items in order to detect which are not discriminative for the scales to which they belong. For that purpose we correlated each of the items with the total value of the scale less the value of the item itself, and, with the rest of the scales. The correlation used was the point biserial (r_{pb}) since the items were dichotomous. The criteria for considering whether items are discriminative for their scales was a correlation exceeding 0.4 with its own scale and a lesser correlation obtained with the rest.

Results

Internal consistency of the scales, represented by the Alpha (α) coefficient of each, can be observed in table 3. The Alpha coefficient in men ranges from 0.68 to 0.84 with an average of 0.77. In women, the range is from 0.63 to 0.85 with an average of 0.76. If we take into account the total sample, values vary between 0.65 and 0.85 with an average of 0.77. As can be seen, there are no significant differences in coefficients obtained by gender. Considering the data from the whole sample, the lowest index of internal consistency is found in the enterprising scale with 0.65, followed by the conventional scale with 0.72. The Investigative and Social scales obtain very similar indexes (0.78 and 0.79 respectively), while the Artistic and Realistic scales have the greatest consistency indexes (0.84 and 0.85 respectively).

Table 3. Alpha Coefficients for the 13 items of each scale in the translated version of the PCI.

SCALES	**Men n= 188**	**Women n= 337**	**Total n= 525**
Realistic	0.84	0.85	0.85
Investigative	0.79	0.78	0.78
Artistic	0.84	0.83	0.84

Social	0.77	0.78	0.79
Enterprising	0.68	0.63	0.65
Conventional	0.72	0.72	0.72

Results from the item analysis enabled detection of the least discriminative items for each scale, based on calculating its homogeneity index.

As stated earlier, we consider items discriminative which exceed a correlation of 0.4 between the item and the total score for its scale less the item itself, and additionally obtains lower correlations with the rest of the scales.

All the correlations that meet the criteria are significant at a level of 0.01. It is worth mentioning that, of the item correlations that do not meet the criteria, only correlations for two of them (17 and 48) are not significant at the level specified (0.01), while the rest are.

Based on results found, out of 78 items that comprise the Position Classification Inventory, there are 32 items that do not meet the established criteria, distributed among the scales as indicated:

Table 4. Items by scale which do not meet the criteria.

SCALES	ITEM NUMBER	TOTAL ITEMS
Realistic	19, 37	2
Investigative	14, 20, 62, 80	4
Artistic	21, 27, 33	3
Social	4, 28, 34, 58	4
Enterprising	5, 11, 17, 23, 29, 35, 41 47, 65, 77, 83	11
Conventional	6, 18, 24, 36, 42, 48, 54, 60, 78	9
	TOTAL	**33**

Thus, the Enterprising and Conventional scales have the largest number of items that do not meet the criteria. Their distribution is as follows: 11 items in the Enterprising scale, meaning 84.6% of the total scale and 9 items for the Conventional scale (69.2%). It should be noted that Gottfredson and Holland (1991a), in their analysis for reliability and validity of the instrument in its first version, found that the Enterprising scale showed the least reliability and discriminative validity. In fact one of the priorities proposed for the future development of the instrument was to improve this scale.

The scale for which best results were obtained was the Realistic (2 items), followed by the Artistic with 3 items that do not meet the criteria, and the Investigative and the Social, both with 4 items.

Thus, summarizing these results, there are 33 items in the PCI that do not meet the criteria, representing 42.3% of the questionnaire. The remaining 57.7% can be considered as discriminative for the scales to which they belong.

DISCUSSION

Based on results found, we can affirm that reliability indexes for the scales in the Position Classification Inventory (PCI) translation are similar to those obtained by Gottfredson and Holland (1991b) in their normative sample, except for the Enterprising scale and to a lesser extent the Social, where the reliability index found is significantly lower than the rest.

As can be noted in Table 4, there are four scales that do not meet a reliability index (internal consistency) of 0.80, the minimum recommended by Cronbach. Thus it would be necessary to modify the instrument to improve reliability of its scales, especially the Enterprising scale.

As for the item analysis, data obtained are in agreement with the reliability indices by scale, since the lowest Alpha coefficients are found for the Enteprising (0.65) and Conventional (0.72) scales, those having the greatest number of items, 11 and 9 repectively, that do not meet the established criteria. Similarly, the rest of the scales (Realistic, Artistic,

Social and Investigative) are those possessing the greatest reliability indices, having a lesser number of items that do not meet the criteria.

This analysis enables detection of 33 items that do not meet the established criteria (exceeding a correlation of 0.4 with its own scale and obtaining lesser correlations with the rest), representing 42.3% of the questionnaire. Therefore, we find it advantageous, for application to the Spanish population, to make an adaptation of the PCI where the items mentioned are modified, in order to attain a more precise instrument with greater reliability indices for its scales.

In conclusion, to state that although the PCI translation obtains reliability indices similar to those obtained by Gottfredson and Holland (1991b) in their normative sample, except for the Enterprising scale, which obtains a significantly lower reliability index than the rest, we consider it profitable to perform a new study with different samples toward the end of verifying the questionnaire's reliability. On the other hand, we suggest, for a future application with the Spanish population, that an adaptation of the PCI be produced, considering the substitution of the least discriminative items (therefore, with lesser homogeneity index with their scale), with others that are more discriminative of the scales they belong to, in order to improve the reliability and validity of the scales which form the instrument.

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