

Holland's hexagonal personality model for a sample of Greek university students

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Abstract The aim of this study was to describe the hexagonal person-environment fit for the Holland personality types for a Greek sample of 156 university students. The statistical analysis followed both exploratory—such as multidimensional scaling—and confirmatory methods—such as covariance structure models. These methods were employed in an exploratory sense, in a descriptive attempt to portray Holland's hexagon structure for this Greek sample. The findings of this study are comparable to the overall theory and other international samples, and also serve as a first psychometric testing of the Self-Directed Search in a Greek population.

Résumé. Le modèle hexagonal de la personnalité de Holland appliqué à un échantillon d'étudiants universitaires grecs. Le but de cette étude était de décrire le degré d'ajustement personne-environnement selon le modèle des types de personnalité de Holland dans un échantillon grec de 156 étudiants universitaires. L'analyse statistique a combiné des méthodes exploratoires—comme le multidimensional scaling—et confirmatoires—comme des modèles de structure de covariances. Ces méthodes ont été utilisées dans une perspective exploratoire, en vue de dépeindre descriptivement la structure de l'hexagone de Holland de cet échantillon grec. Les résultats de cette étude sont comparables à la théorie générale et à ce que l'on trouve sur d'autres échantillons internationaux; ils constituent également le premier testing psychométrique du *Self-Directed Search* sur une population grecque.

Zusammenfassung. Hollands hexagonales Persönlichkeitsmodell bei einer Stichprobe griechischer Studenten. Das Ziel dieser Untersuchung war die Bestätigung der Anwendbarkeit des hexagonalen Person-Umwelt-Konzepts der Persönlichkeitstypen nach Holland für eine Stichprobe von 156 griechischen

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Universitätsstudenten. Die statistische Analyse verwendete sowohl befragende—wie z.B. multidimensionale Einschätzungen—als auch bestätigende Methoden—wie z.B. Kovarianz-Strukturmodelle. Diese Methoden wurden in einem erforschenden Sinn angewendet, in einem beschreibenden Versuch zur Darstellung von Hollands Hexagonal-Struktur für diese griechische Stichprobe. Die Ergebnisse dieser Untersuchung sind vergleichbar mit der zu Grunde liegenden Theorie und anderen internationalen Ergebnissen, und sie dienen als erste psychometrische Testung der SDS (Self-Directed Search) bei einer griechischen Gruppe.

Resumen. El Modelo Hexagonal de Holland aplicado a una Muestra de Estudiantes Universitarios Griegos. La finalidad de este estudio fue describir el ajuste entre la persona y el ambiente de los tipos de personalidad de Holland (modelo hexagonal) en una muestra de 156 estudiantes universitarios. Paea el análisis estadístico se aplicaron métodos tanto exploratorios—como el escalado multidimensional—*multidimensional scaling*—como confirmatorios—como los modelos estructurales de co-varianza. Estos métodos se usaron en un sentido exploratorio, con la intención de describir la estructura hexagonal en esta muestra griega. Los resultados de este estudio son comparables con la teoría general y con su aplicación a otras muestras internacionales, y sirven también como una primera evaluación psicométrica de la Búsqueda Auto-Dirigida (Self-Directed Search) en una población griega.

Keywords Self-Directed Search · Hexagon structure · Circumplex model

It has been over 40 years since Holland first proposed his theory of vocational choice, which continues to be widely accepted by the career guidance counselors (Herr, Cramer, & Niles, 2004). Holland's (1997) theory of vocational interests postulated the existence of six broad personality types and environmental models that describe people's personalities and the environments in which they are exhibited. In Holland's theory the six vocational personality types—Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C) (RIASEC)—compose the points of an hexagon. Along the hexagon continuum, the types that are closer to each other are more alike than those that are more distant or opposite.

A number of researchers have recently extended the investigation of Holland's theorised structure of interests to different populations (Einarsdóttir, Rounds, Egidóttir, & Gerstein, 2002; Fouad & Dancer, 1992; Haverkamp, Collins, & Hansen, 1994). In this assessment researchers have attempted to determine whether Holland's six types are identifiable and whether the observed ordering and shape of the RIASEC configuration is comparable. According to Fouad and Dancer (1992) interest structure is not universal and may be influenced by culture or ethnicity. Rounds and Tracey (1996) also suggested that culture system can influence the strength and interrelations of preferences.

Even though Holland's model has intrigued the interest of Greek scientists who are involved in vocational assessment and guidance (Panagiotou, 2003;

Sidiropoulou-Dimakakou, Touloumakou, & Papadakou, 2004; Tetradakou, 1997), there is lack of relevant research in Greece. The study of vocational interest structure in a social and cultural setting that is different from the United States has practical and theoretical implications for vocational guidance in Greece. Testing Holland's theory in Greece may shed light on some culture-bound assumptions and can also be informative about the possible influence of social, cultural, and contextual factors in career choice and development (Hesketh & Rounds, 1995). Holland's model would be an excellent "springboard" (Furnham, 2001) in the framework of developing and refining their own ideas, tackling the difficult problems of measuring person-environment structure and understanding its consequences in another culture outside the United States.

Structural studies of vocational interests in the United States have supported the invariance of Holland's model across gender (Anderson, Tracey, & Rounds, 1997; Tracey & Rounds, 1993). No consistent gender differences were detected in the cross-cultural meta-analysis of Holland's theory (Tracey & Rounds, 1996). Gender differences in the structure of vocational interests have yet to be evaluated in Greece, since no such attempt has been made, at least in terms of structure.

The aim of this study was to closely picture the hexagonal person-environment fit for the personality types that Holland has operationalised (Holland, 1985) for a Greek sample of undergraduate and graduate university students. This approach relied on both exploratory methods for the hexagon circumplex but also on statistical fit testing of the theory through structural equation modelling addressing the questions of which is the circumplex structure of the personality types for this Greek sample. The findings of the present study—even the confirmatory models—should be regarded as first stage exploratory attempts, and should be comparable to the overall theory and other international samples in order to serve in describing psychometric characteristics of the Self-Directed Search (SDS) in a Greek population.

Method

Sample

The sample consisted of 156 university students, 84 at the undergraduate level (53.8%) and 72 at the postgraduate level of their studies (46.2%). The undergraduate students' median age was 21 years; for the postgraduate students, though, median age, as expected, was higher (26 years). Approximately 60% of the sample were females (94 females, 62 males), which is close to the current gender representation in Greek Universities.

Undergraduate students were mainly (78.6%) studying Pedagogy and Philosophy—their future employment being high-school teachers—and 21.4% were studying Psychology. Postgraduate students were attending either the School Psychology M.Sc. course (47.2%) or the Counselling and Career Guidance M.Sc. course (52.8%). A cross-tabulation of the level of studies (undergraduate or postgraduate) and students' gender, resulted in 52 female students (33.3%) at the undergraduate level, and 42 (26.9%)

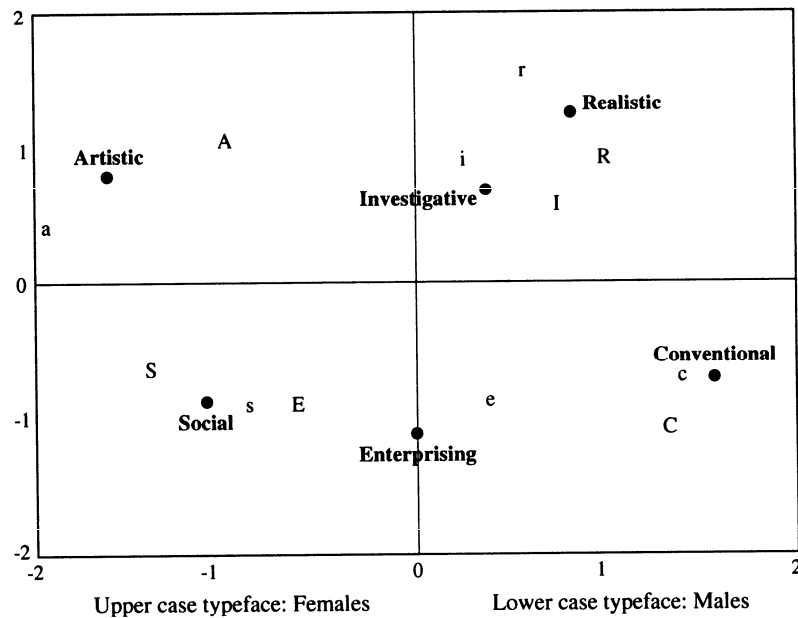


Fig. 1 Two-dimensional scaling solutions for the six personality types (all subscale aggregate T-scores), overall and by gender

and $R^2 = .99$. For the male sample only ($N = 59$), Young's Stress = .0003 and $\bar{R}^2 = .99$. Both male and female personality structures seem to generally follow the overall pattern; nevertheless, there are "discrepancies" between the two genders as depicted for their trigonometric transformations on the circle periphery.

The main reason for trigonometric transformations in this study was that exploratory multidimensional scaling solutions often suffer from interpretation problems, specifically when the dimensions do not immediately portray constructs or latent traits. For example, one cannot easily suggest that the first dimension represents a contrast between a group of three personality types (namely Realistic, Investigative, and Artistic) and another group (namely Conventional, Enterprising, and Social), since such a contrast does not seem to be easily readable in the initial two-dimensional plot (Fig. 1); in fact, under this "eye-balling" procedure (Tracey, 2000), any contrast between two groups of personality types does not readily reflect a specific latent factor, since the theoretical presupposition of placement of all personality types on a hexagon continuum, is not clearly met. A possible way to circumvent this problem is to constrain the model by estimating the measures' relative position regardless of their distances from the central (0, 0) point on the axes. Thus, we would use only the information given by their orientation in regard to this central point. The angles formed by this orientation (the coordinates on the two axes), were computed for each personality type through an arctangent transformation and were then transformed to degrees on the circumference, a method of analysis also successfully employed by Mylonas (in Veligekas et al.,

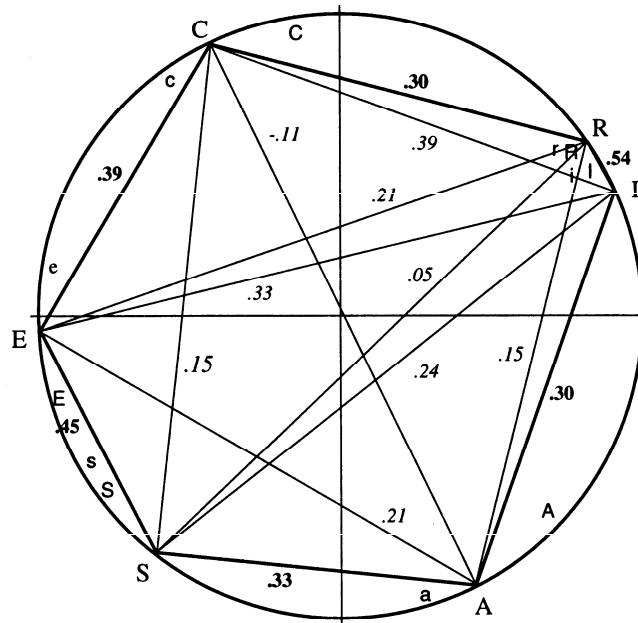


Fig. 2 Two-dimensional scaling solutions (all subscale aggregate T-scores, trigonometric transformation) and Pearson correlations for the six personality types, overall and by gender. Key: Outside the circumference: total sample ($n = 152$), Inside the circumference: upper case typeface: females ($n = 93$); lower case typeface: males ($n = 59$)

2007). These degrees, for the total sample (and also for males and females separately), were plotted in Fig. 2. This figure partially enhances interpretation of the relative position of the six personality types on the circumference in respect to constructs involved. Also, by rotating these relative positions in respect to an arbitrary point (for Fig. 2, the Realistic position) the problem of reversed scaling on the axes could be circumvented, and all groups under consideration (overall, females, males) become comparable in respect to their two-dimensional scaling solutions. The correlation coefficients between all pairs of personality types are also reported in Fig. 2, for the total sample only.

The overall solution seems to generally follow Holland's model, but there is some difference; the Realistic and the Investigative types are very closely linked, whereas one would expect some distance between them, as is the case for the remaining four personality types. Also, for both genders the pattern remains approximately the same with small differences in the relative distance of some personality types (e.g., the Conventional-Enterprising-Social subsystem is rather loose for the female sample). The main finding at this stage is obviously the Realistic-Investigative subsystem of homogeneous measures, with the two personality types closely linked also when each gender is examined separately.

Structural equation modeling of Holland's circumplex for the Greek data

To explore the main finding further, confirmatory methods were employed, although it should be kept in mind that the nature of this study still remained exploratory. The methods employed have been previously tested in direct relation to Holland's hexagon (Prediger, 1982; Rounds & Tracey, 1993) and in a more general sense (e.g. Hofstee, de Raad, & Goldberg, 1992) where factor representations of circumplex models have been dimensionally tested in a confirmatory sense. Tracey (2000) has also summarised a large number of confirmatory and other methods when analysing circumplex structures. Some of the suggested-available options were implemented in this study as well, namely testing for Prediger's models in respect to Holland's hexagon (Rounds & Tracey, 1993) and also for the circulant and Geometric Circulant models as described by Tracey (2000). The statistical procedures and their results are described as follows and in Table 3.

In all, six models were tested. As a point of reference or "benchmark" model, the null model with all six personality types considered as independent factors was tested as the first model. The statistical fit associated was as expected extremely poor. A data driven model (as suggested by exploratory factor analysis results for this study's measures) was also tested, although just as another point of reference because of its ipsative nature. For this data-driven model to be formulated, principal component analysis and maximum likelihood estimation exploratory factor analyses were carried out initially, applying orthogonal rotation of the axes to both models. The maximum likelihood solution was clearer but the principal components solution seemed closer to the present data and to the original theoretical model with two sets of adjacent types (C-R-I, S-E-C) loading on factors one and two respectively and with a third bipolar factor including A and C types in contradistinction. This PCA three-factor solution was considered useful for comparison with the theoretical models to be tested and resulted in rather acceptable levels in terms of the Normed-Fit index and the Tucker-Lewis index, although RMSEA and χ^2 significance levels were still far from satisfactory.

The circulant model hypothesis (Tracey, 2000) tests for adjacent types are related, while the two steps away types are less correlated and the opposite types in the circumplex are even less correlated. For this model, tested third in order, the statistical fit was poor and the RMSEA index was very high. The Normed-Fit index

Table 3 Structural equation modeling of Holland's circumplex (summary table)

Model	χ^2	df	RMSEA	NFI	TLI
1. Null (six independent factors)	211.19	9	.39	NA	NA
2. Data driven (as computed via PCA, varimax)	51.38	7	.20	.75	.72
3. Circulant	78.17	11	.20	.60	.73
4. Geometric circulant	79.97	10	.22	.56	.69
5. Prediger's two-factor (constrained)	44.95	5	.23	.79	.64
6. Prediger's two-factor (unconstrained)	44.00	5	.23	.79	.65

Note: All χ^2 criteria are statistically significant at the .001 level