SPECIAL ISSUE

Cross-Cultural Research in Psychology: Studies in Four Continents

Editor
STELLA VOSNIADOU
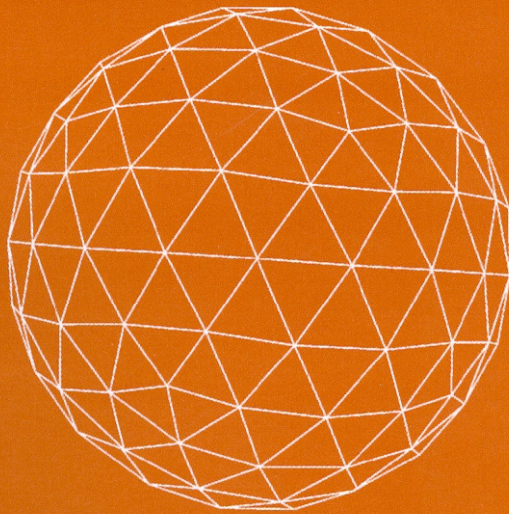
Special Issue Editors
AIKATERINI GARI & KOSTAS MYLONAS

Ελληνικά
γράμματα

ΨΥΧΟΛΟΓΙΑ

PSYCHOLOGY

Contents

Περιεχόμενα

Statistical analysis techniques
based on Cross-Cultural research methods:
cross-cultural paradigms and intra-country comparisons

KOSTAS MYLONAS[1]

ABSTRACT

Accumulated cross-cultural research has shown that its methods can also apply within countries, especially as more and more different immigrants or sojourners flow into host countries and the need to deal at least with acculturation issues is pressing. Cross-cultural methodology approximates research on intra-country issues, since comparing groups with different characteristics within countries may also reflect different "cultures" represented by each of the differential groups. A question of bias elimination is raised when such comparisons are attempted either under a Cross-Cultural or an intra-country scope. Taking the van de Vijver and Leung and the Poortinga and van de Vijver theories on bias in terms of culture as a starting point, a triple-fold paradigm employing factor analysis and other techniques is presented on: (a) the application of simple congruence coefficients in estimating factor similarity –that is, basic factor equivalence testing– along with a proposed method of taking advantage of the Tucker coefficient matrix for a set of two or more factor structures, (b) the within-country application of multilevel covariance structure analysis and Procrustean rotations for a set of between groups and pooled-within correlation matrices, and (c) the reduction of "bias in terms of culture" by eliminating variance components through multivariate methods. By incorporating some of these methods in standard -within country- psychological research, we should be able to gain on theoretical and psychometric grounds and we may finally question the degree of construct similarity among groups within a country, which cannot be necessarily taken for granted. These considerations are closely related to the use of multilevel analyses, as these stem from Cross-Cultural Psychology through most forms of intra-country and/or inter-country comparisons.

Key words: Factor equivalence testing, Trigonometric transformations for Multidimensional scaling solutions, Multilevel Covariance Structure analysis, Weirdness index, "Hit matrix" clustering.

1. Address: Department of Psychology, The University of Athens. Panepistimiopolis, Ilisia, 157 84, Athens Greece. Tel. ++30210 7277 584, Fax. ++30210 7277 534 (attn. Kostas Mylonas), e-mail: kmylonas@psych.uoa.gr

Table 3
Arctangent transformation for point (y, x) on a (–π, π) range

For any circle,   Circumference $= 2\pi r$,   (2)
where r is the angle expressed in radians,

Given that,   degrees $= r\dfrac{180}{\pi}$,   (3)   and also given that $\mathrm{sgn}(a) = \dfrac{a}{|a|}$,   (4)

and for $\hat{\varphi}$ satisfying: $\tan(\hat{\varphi})^{*} = \left|\dfrac{y}{x}\right|$, $(0, \dfrac{\pi}{2})$ (5),

the quadrant-specific inverse tangent with a range of $(-\pi, \pi)$, *is calculated as*:

for $y \neq 0$ and $x>0$, $r(y, x) = \tan^{-1}\left(\left|\dfrac{y}{x}\right|\right) [\mathrm{sgn}(y)]$,   (6)**

for $y \neq 0$ and $x=0$, $r(y, x) = (\dfrac{1}{2}\pi) [\mathrm{sgn}(y)]$,   (7)

and for $y \neq 0$ and $x<0$, $r(y, x) = \{\pi - [\tan^{-1}\left(\left|\dfrac{y}{x}\right|\right)]\} [\mathrm{sgn}(y)]$,   (8)

Note: $\tan^{-1}(\dfrac{y}{x}) \neq [\tan(\dfrac{y}{x})]^{-1} = \dfrac{1}{\tan(\dfrac{y}{x})}$ (9)

---

* As expressed in radians.
** The trigonometric number $\tan^{-1}(\dfrac{y}{x}) = \tan^{-1}(z)$ is defined through the Mclaurin series as the function of the infinite sum of terms calculated from the x values of its derivatives at a single point (including the derivative at point "0").
In notation, $\tan^{-1}(z) = \sum_{n=0}^{\infty} \dfrac{(-1)^{n} z^{2n+1}}{2n+1}$ with a convergence criterion of .00001 and for $|z| \leq 1$. In logarithmic notation,
$\tan^{-1}(z) = \dfrac{i}{2}\log(\dfrac{i+z}{i-z})$. More rapid convergence is achieved through Euler's $\tan^{-1}(z) = \sum_{n=0}^{\infty} \dfrac{2^{2n}(n!)^{2}}{(2n+1)!}\dfrac{z^{2n+1}}{(1+z^{2})^{n+1}}$.
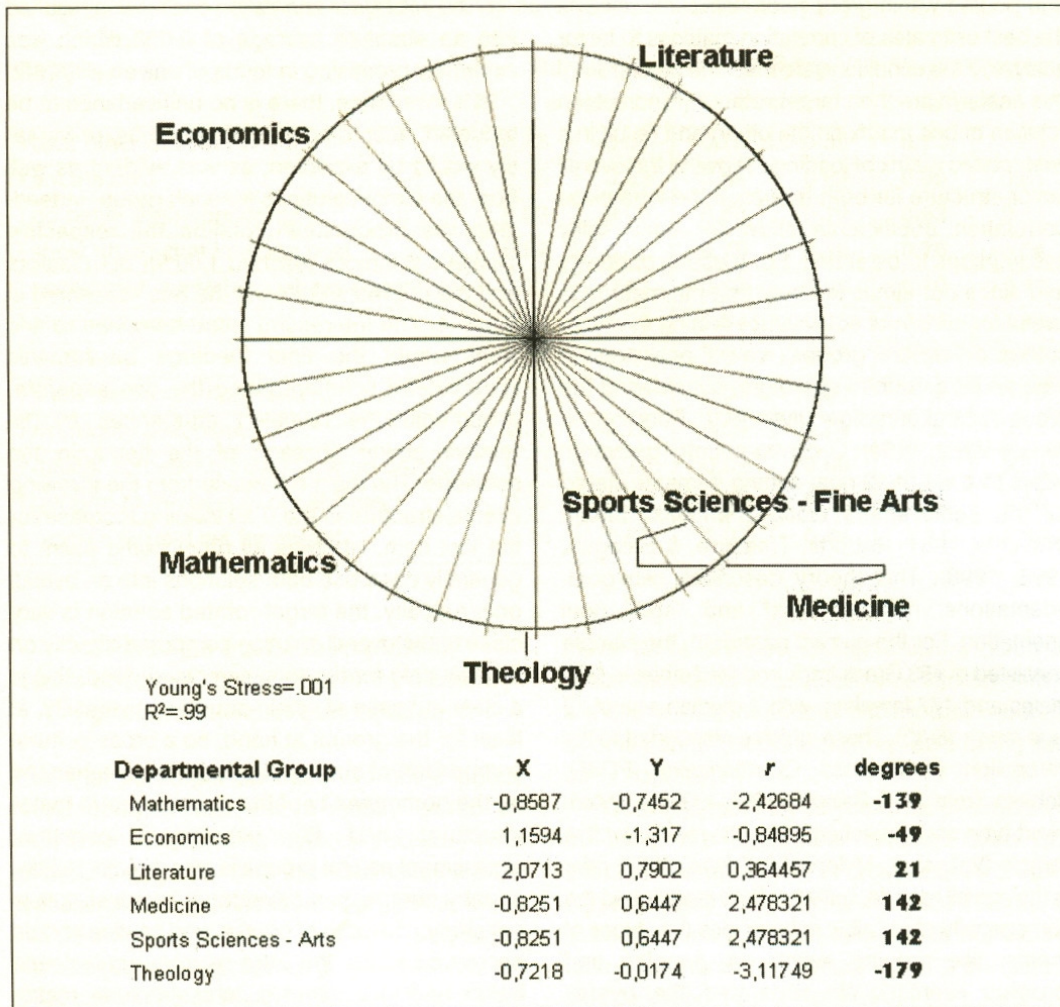
paradigm are presented in Figure 1 along with the respective trigonometric transformation plot.

The circumference plot is quite revealing in respect to the homogeneous groups as defined by their factor equivalence levels. Although the Sports Sciences (Fine Arts) subsample unexpectedly matched the Medicine structure, the overall clustering of departmental groups can be clearly considered interesting and certainly useful with its further implementation in computing the factor structure for each of the two clusters namely the Literature and Economics cluster and the Mathematics, Theology, Medicine and Sports Science (Fine Arts) cluster of groups. Such clustering of countries has yielded interesting and

theoretically sound results in previous research (Gari, Panagiotopoulou, & Mylonas, 2008). The overall method of trigonometric transformation of the multidimensional scaling coordinates has also been employed for clustering of variables, with exceptionally interesting and sound findings (Georgas et al., 2004; Gari & Mylonas, 2006).

This first paradigm can be summarized into two main points: (a) Exploring for factor equivalence across within-country groups is by itself a "prerequisite" for further comparison to follow across these groups. In order to be able to interpret possible mean similarities or differences it would be very supportive if not necessary to have already shown that the groups under

Figure 1
Multidimensional scaling overview for the Religious Value Scale (N=462)

Young's Stress=.001
R^2=.99

Departmental Group	X	Y	r	degrees
Mathematics	-0,8587	-0,7452	-2,42684	**-139**
Economics	1,1594	-1,317	-0,84895	**-49**
Literature	2,0713	0,7902	0,364457	**21**
Medicine	-0,8251	0,6447	2,478321	**142**
Sports Sciences - Arts	-0,8251	0,6447	2,478321	**142**
Theology	-0,7218	-0,0174	-3,11749	**-179**

comparison are indeed comparable on the construct level. (b) Employing the hit matrix method along with the trigonomerically transformed multidimensional scaling solution for the information on the levels of factor equivalence across a number of within-country groups can be either of metric importance (same constructs assessed), of theoretical importance (clusters of groups), or both.

3. Paradigm #2. Achievement Goal Orientation theory and Multilevel Covariance Structure analysis

Another way to test for construct equivalence in Cross-Cultural Psychology is to employ the Muthén method (1994, 2000) as extended to factor analysis and presented in detail by van de Vijver and Poortinga (2002). This method takes