INDIVIDUAL DIFFERENCES IN LATERALIZED COGNITIVE STRATEGIES: "THE HUMAN INFORMATION PROCESSING SURVEY"

Ruiz, J., Tous, J.M & Fusté, A.

Department of Personality, Assessment and Psychological Treatment

UNIVERSITY OF BARCELONA

INTRODUCTION

Most researches agree that the two cerebral hemispheres differ in terms of cognitive functioning. Indeed, there is some evidence of an individual's propensity to use a mode of processing associated with one hemisphere or the other when given a choice (see for reviews e.g. Hellige, 1993). Ourselves have provided data supporting differences between individuals in the extent to which they rely on the cognitive process of each hemisphere (Tous, Fusté & Vidal, 1995); and such differences seems to be associated to certain personality dimensions (Ruiz, Tous & Viadé, 1997).

With regard to the specific field of the assessment of lateralized cognitive strategies, Torrance, Taggart and Taggart (1984) developed the *"Human Information Processing Survey (HIPS)"*. The HIPS is a paper-and-pencil test for assessing an individual in terms of processing preference. The Survey consists of 40 statements with three forced-choice selections each. In this study the three choices for each statement have been treated as independent responses (thus threre are 120 items). Therefore, each alternative of response constitutes a subscale which is associated to the particular right (HIPS-R), left (HIPS-L) or integrated (HIPS-I) style of hemispheric processing. The reliability and validity indices of the original HIPS appear acceptables (see for reviews e.g. Taggart & Torrance, 1984; Beyler & Schemeck, 1992), wherefore this scale seems to be an useful instrument to assess the hemisphere's cognitive styles.

PURPOSE

- To analyse the psychometric properties (internal consistency, reliability indices and factor structure) of a Spanish version of the HIPS.
- To verify individual differences in lateralized cognitive strategies of information processing as a function of sex and handedness.

METHOD & PSYCHOMETRIC ANALYSIS

SUBJECTS

The sample consisted of 465 Spanish undergraduate students (255 females and 210 males) recruited from the campus of the U*niversity of Barcelona (UB)*, and the *School of Police of Catalonia (SPC)*. Their ages ranged from 18 to 53 years, with a mean of 22.47 years (Std. Dev.=3.47) for females, and a mean of 24.91 years (Std. Dev.=5.25) for males.

The HIPS scores are normally distributed in the three subscales (p>0.05 at Kolmogorov-Smirnov Test). To test if the HIPS scores were different between males and females a MANOVA was performed with the three subscales. All variables comply with Homocedasticity Test (p>0.05). Significant differences were found between sexes in HIPS-R and HIPS-I. As we can see in the *"Hemisphericity and Sex"* graph, women score higher than men in the HIPS-R scale ($F_{(1,463)}$ =8.72 p=0.003). However, men get higher scores than women in the HIPS-I scale ($F_{(1,463)}$ =6.21 p=0.013).

DISTRIBUTION OF SAMPLE BY SEX AND CENTER OF RECRUITMENT

HIPS	UB	SPC	N	%
FEMALES	150	105	255	55%
MALES	105	105	210	45%
N	255	210	465	100%
%	55%	45%	100%	

DESCRIPTIVES OF THE HIPS SCORES BY SEX

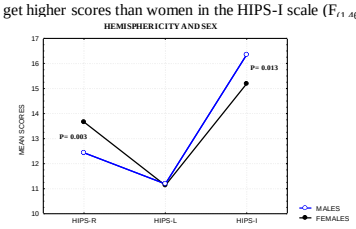
SCALES	HIPS-R		HIPS-L		HIPS-I	
SEX	Mean	S.D.	Mean	S.D.	Mean	S.D.
FEMALES (N=255)	13.66	4.40	11.13	4.00	15.19	4.95
MALES (N=210)	12.43	4.54	11.19	3.84	16.35	5.04
BOTH SEXES (N=465)	13.10	4.50	11.15	3.93	15.71	5.02

DESCRIPTIVES OF WOMEN SAMPLE SEPARATED BY HANDEDNESS CATEGORIES

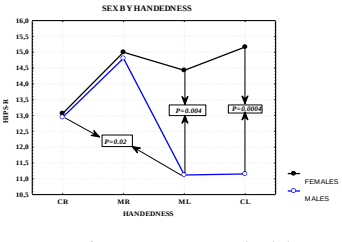
IL	N	HIPS-R	HIPS-L	HIPS-I
CR	172	Mean= 13.06 Std. Dev.=4.17	11.23 4.04	15.56 5.03
MC	38	15.00 4.44	11.00 4.43	14.26 4.95
ML	21	14.42 5.11	10.80 3.28	14.80 5.41
CL	24	15.16 4.65	10.87 3.81	14.29 3.75

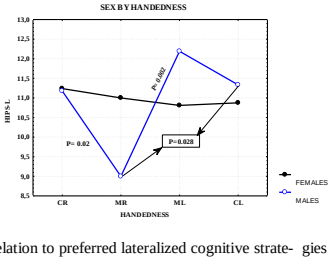
DESCRIPTIVES OF MEN SAMPLE SEPARATED BY HANDEDNESS CATEGORIES

IL	N	HIPS-R	HIPS-L	HIPS-I
CR	108	Mean=12.94 Std. Dev.=4.44	11.17 3.87	15.76 5.04
MC	21	14.80 5.16	9.00 3.86	16.19 5.63
ML	42	11.11 4.03	12.19 3.57	16.85 4.99
CL	39	11.15 4.35	11.33 3.68	17.51 4.67



To verify differences in cognitive strategies of information processing, associated by some researches (e.g. Coren, 1995) to the hemispheric asymmetry as a function of handedness and sex, subjects were subdivided by sex into four categories of manual lateralization. The index of manual lateralization (IL) was computed as suggested by Coren (1993). Ambilateral subjects were included into mixed left-hander category (ML).





DISTRIBUTION OF SAMPLE BY HANDEDNESS

CONSISTENT RIGHT-HANDERS (CR) — CONSISTENT LEFT-HANDERS (CL)

MIXED RIGHT-HANDERS (MR) — MIXED LEFT-HANDERS (ML)

The analysis of the interaction "sex by handedness" in relation to preferred lateralized cognitive strate- gies yield significant differences in the HIPS subscales, such as is shown in the above graphs. In HIPS-R, moreover of differences shown, it is worth noting differences between consistent right-handed (CR) and consistent left-handed (CL) males (p=0.029). Likewise, consistent right-handed (CR) females score significantly greater than consistent left-handed (CL) males (p=0.002). Furthermore, significant differences were found between consistent left-handed (CL) males and females in the HIPS-I subscale (p=0.013). The females's score tendency in HIPS subscales show higher homogeneity among different groups of manual lateralization than men groups. This tendency confirms results of previous works with similar scales (Ruiz, Tous & Viadé, 1997).

RELIABILITY INDICES

RELIABILITY INDICES OF HIPS SUBSCALES

N=465	HIPS-R	HIPS-L	HIPS-I
Nº ITEMS	40	40	40
Mean	13.35	11.03	15.67
Std. Dev.	4.53	3.78	4.98
Cronbach's α	0.64	0.54	0.67
Estandardized α	0.65	0.53	0.67

SPLIT-HALF RELIABILITY INDICES OF THE HIPS SUBSCALES

N=465	HIPS-R		HIPS-L		HIPS-I	
1st & 2nd Half	Half-1	Half-2	Half-1	Half-2	Half-1	Half-2
Nº Items	20	20	20	20	20	20
Mean	7.80	5.55	5.12	5.92	7.14	8.53
Std. Dev.	2.61	2.55	2.19	2.30	2.77	2.97
Cronbach's α	0.40	0.50	0.37	0.31	0.49	0.51
$r_{x,y}$ half 1-2	0.53		0.42		0.50	
Spearman-Brown	0.69		0.59		0.67	
Guttman Index	0.69		0.59		0.67	

TESTS - RETEST RELIABILITY

TEST - RETEST
(After 9 weeks)

N=179 TEST	RETEST HIPS-R	RETEST HIPS-L	RETEST HIPS-I
HIPS-R	0.75**	- 0.16*	- 0.54**
HIPS-L	- 0.14	0.68**	-0.41**
HIPS-I	- 0.49**	- 0.39**	0.77**

** Significant at p<0.001 * Significant at p<0.05

FACTOR ANALYSIS

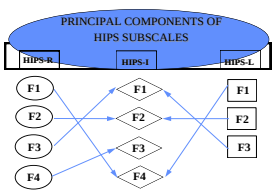
Given the way the items of HIPS are constructed (two of the three choices are "opposites") the analysis of all items jointly is not suitable, because the matrix of correlation matrix of these variables not allows to perfom a reliable factor analysis for the Survey as a single scale. So that, in this study we have examined separately the factor structure of each subscale of the Spanish version of HIPS by using *principal components* method of factor extraction, and *varimax* as method of rotation. *Oblique* rotation method was rejected because the poor correlations between factors in the three subscales (the higher coefficient was -0.16).

FACTOR ANALYSIS OF HIPS *(N=465)*

FEATURES OF THE CORRELATION MATRIX	HIPS-R	HIPS-L	HIPS-I
Determinant	0.0098927	0.0249035	0.0270412
KMO	0.69	0.62	0.66
Bartlett Test of Sphericity	2076.86 (Sign=.0000)	1661.12 (Sign=.0000)	1624.0750 (Sign=.0000)
% OFF-Diagonal elem.>0.09	6% (94)	4.7% (74)	5.9% (92)
FACTOR EXTRACTION			
Fact. with Eigenvalues > 1	15	16	15
Cum Pct of Var	56.6%	57.2%	54%
Residuals > 0.05	276 (35%)	294 (37%)	324 (41%)
Criteria Factors (*scree test)*			
(≥3 items with load..> 0.35)	4	3	4
Cum Pct of Var	(23%)	(17%)	(21%)

The features of factor analysis of the three HIPS subscales are shown in the table above.

The criterion for accepting factors as meaningful was the *scree test*, and also factors with 3 or more items and loadings grater than 0.35. Label of principal components of HIPS subscales are shown in the table below.



LABELS OF THE PRINCIPAL COMPONENTS OF HIPS SUBSCALES

SUBSCALES	F1	F2	F3	F4
HIPS-R	FANTASY	OPEN-ENDED	INTUITION	ACTING
HIPS-L	PRAGMATISM	ANALYSIS	RATIONALISM	
HIPS-I	INTUITION/ RATIONALISM	OPEN-ENDED/ ANALYSIS	ACTING/ REFLECTION	FANTASY/ PRAGMATISM

CONCLUSIONS

✞ On the whole, psychometric analysis of the Spanish version of HIPS results in acceptable reliability indices for the three subscales. Nevertheless, such a factor analysis shows, items are clustered in a complex structure with a lot of principal components. Therefore, we consider suitable to perform an accurate item analysis in order to improve the homogeneity indices and internal consistency of the scale.

✞ With regard to individual differences in lateralized cognitive strategies of information processing assessed by HIPS, in relation to sex and handedness, it is worth noting the most meaning finding is that handedness seems to affect differentlly to HIPS scores depending on sex.

REFERENCES

- Beyler, J. & Schmeck, R. (1992). Assessment of individual differences in preferences for holistic-analytic strategies: Evaluation of some commonly available instruments. *Educational and Psychological Measurement, 52 (3),* 709-719.
- Coren, S. (1993). The Lateral Preference Inventory for measurement of handedness, footedness, eyedness and earedness: Norms for young and adults. *Bulletin of the Psychonomic Society, 31 (1),* 1-3.
- Coren, S. (1995). Differences in divergent thinking as a function of handedness and sex. *American Journal of Psychology, 108 (3),* 311-325.
- Hellige, J. (1993). Hemispheric Assymmetry. What's Right and what's Left. London. Harvard University Press.
- Ruiz, J., Tous, J.M. & Viadé, A. (1997). Individual differences in personality, hemispheric specialization and cognitive strategies of information processing. *8th. Conference of the International Society for the Study of Individual Differences (ISSID). Denmark.*
- Torrance, P., Taggart, B. & Taggart, W. (1984). Human Information Processing Survey. *Scholastic Testing Service, Inc.*Bensenville, Illinois.
- Tous, J.M., Fusté, A. & VIdal, J. (1995). Hemispheric specialization and individual differences in cognitive processing. *Personality and Individual Differences, 19 (4),* 463-470.

9th EUROPEAN CONFERENCE ON PERSONALITY (ECP9), University of Surrey UNITED KINGDOM (1998)