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Holistic Reasoning on the Other Side of the World: Validation of the Analism/Holism Scale in Mexicans

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Abstract

The universality of cognitive processes has been called into question. Research suggests that individuals from Eastern cultures (e.g., China, Korea) when compared to individuals from Western cultures (e.g., the United States) prefer to reason holistically. This line of research has not been extended to cultural groups far removed from cultures traditionally surveyed in cross-cultural research such as Hispanics. We conducted two studies to understand: 1) the generalizability of the construct of holistic reasoning in Mexicans, and 2) the preferred reasoning style of Mexicans when compared to U.S. Americans. Results support the generalization of the factor structure of holistic reasoning as originally hypothesized by Choi, Koo, and Choi (2007). The results of Study 2 suggest that Mexicans scored higher than U.S. Americans on certain aspects of holistic reasoning.

Research indicates that culture influences reasoning style. Studies suggest that when solving reasoning problems, individuals from Eastern cultures compared to individuals from Western culture, such as China and Korea, prefer holistic strategies over analytical ones when these two are in conflict (Norenzayan, Smith, Kim, & Nisbett, 2002). For example, Chinese and Korean participants rely on instances that are readily accessible (exemplars) rather than apply formal rules in artificially created categorization tasks. Moreover, during conceptual organization individuals from Eastern cultures rely on intuition rather than on abstract logic (Norenzayan, Smith, Kim, & Nisbett, 2002). Similarly, in categorization tasks, individuals of Asian descent emphasize similarities and relationships between objects whereas individuals from Western cultures emphasize rules and formal reasoning (Ji, Peng, & Nisbett, 2000). These reasoning preferences have been termed holistic reasoning tendencies.

Recently, the Analism/Holism Scale (AHS; Choi, Koo, & Choi, 2007) was developed to capture individual level variability in the construct of holistic reasoning. The AHS attempts

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to capture the following four dimensions of holistic thinking: 1) Causality, defined as the belief that elements in the universe are interconnected forming complex causal relationships (Nisbett, 2003), 2) Locus of Attention, defined as a preference to focus attention on stimuli as 'a whole' rather than decomposing it in parts (Nisbett & Miyamoto, 2005), 3) Perception of Change, defined as the preference for viewing situations as dynamic and constantly changing rather than as linear progressions, and 4) Attitude towards contradiction, defined as the preference to preserve harmony by seeking a middle ground between two opposing forces (Nisbett, Peng, Choi, & Norenzayan, 2001).

Research on the cross-cultural variation of reasoning has contributed to our understanding of the generalizability of psychological theories. However, to date, little research has been conducted to understand the generalizability of theories to participants from Mexico and South America. Moreover, the little research that exists has been conducted mainly in the realm of values. In the realm of values, research indicates that Mexicans, like Easterners, exhibit higher collectivism scores in relation to U.S. Americans (Hofstede, 1980). Mexican culture, thus, engenders an interdependent view of the self (Diaz-Guerrero, 1994; Ybarra & Trafimow, 1998; Lechuga & Wiebe, 2009; Ramirez-Esparza, 2007).

Although Hispanics are similar to Easterners regarding the interdependence of the self, their resemblance in reasoning may be less so given Mexico's close proximity to a highly westernized culture, the United States. Noted philosophers and writers have observed that the societal practices of Mexicans are marked by a combination of pre and post Columbian influences (Ramos, 1965; Uranga, 1952; Vasconcelos, 1935). Although Mexican culture was heavily influenced by Greek thought during the colonization period, Aztec and Mayan civilization practices in medicine, religion, and astronomy deviated from the practices encountered in ancient European civilizations. These practices resembled Chinese practices in terms of a reliance on the collective and a belief in alternative healing practices (Garcia, Sierra, & Balam, 1999).

The first aim of this research is to investigate the generalizability of the factor structure of AHS scale to Mexicans via exploratory and confirmatory factor analyses. The second aim of our research is to investigate whether Mexicans, compared to U.S. Americans, exhibit a stronger preference for holistic reasoning.

Study 1: Exploratory and Confirmatory Factor Analysis of the AHS

Method

Participants—Participants were 1,041 students (754 females) taking introduction to psychology courses at the Autonomous University in Juarez City, Mexico. Participants had a mean age of 22.08 ($SD = 5.78$) years. All participants self-identified as Mexican and self-reported Mexico as their country of birth.

Procedure—The AHS was translated into Spanish following the Translation/Back-translation approach suggested by Brislin (1980). Two English/Spanish bilingual graduate students independently translated the AHS first into Spanish and then back into English. The re-translated English version was compared to the original English version and discrepancies were discussed and resolved. After discrepancies were resolved a group of 26 monolingual Spanish students answered the instrument and offered rewording suggestions for clarity purposes. The original items in English are presented in Table 1 and the final translated items are presented in Table 2. We randomly divided our sample to conduct exploratory and confirmatory factor analysis separately. After the split, both samples had equal gender proportions

Measures—Participants answered a demographics questionnaire and the AHS. The AHS is composed of 24 items subsumed by four factors that assess: 1) preferred style of explaining causal relationships (e.g., Everything in the universe is somehow related to each other), 2) preference to resolve contradiction by seeking a middle ground (e.g., It is more desirable to take the middle ground than to go to extremes), 3) preference for a cyclical perception of change (e.g., Every phenomenon in the world moves in predictable directions), and 4) the focus of one's attention (e.g., The whole, rather than its parts, should be considered in order to understand a phenomenon). Response options were captured on a 7 point Likert-type scale where 1 = “completely disagree” and 7 = “completely agree.” The six items assessing preference for a cyclical perception of change were reverse scored. Greater scores indicate greater preference for holistic reasoning.

Results

We computed a MANOVA on the full AHS and on individual subscales with gender as the between subjects factor. Results yielded significant multivariate results for gender $Wilks' \lambda = 2.74, p < .05, \eta^2 = .01$. A significant effect was detected on the full AHS $F(1, 1,037) = 4.43, p < .05$. Women had a higher mean score ($M = 4.60, SD = .66$) than men ($M = 4.50, SD = .67$), ($d = .15$). In terms of individual subscales, significant effects were detected for causality, $F(1, 1,037) = 2.78, p = .06$, women had a higher mean score ($M = 5.30, SD = .87$) than men ($M = 5.19, SD = .87$), ($d = .22$), and attitude towards contradiction, $F(1, 1,037) = 9.81, p < .01$, women had a higher mean score ($M = 5.06, SD = 1.07$) than men ($M = 4.83, SD = 1.05$), ($d = .25$).

We conducted a principal components exploratory factor analysis with varimax rotation. Inspection of eigenvalues and the scree plot before rotation suggested that four factors, which accounted for 40.4%, of the variance should be extracted. Factor 1 (causality) accounted for 17.37% of the variance, factor 2 (locus of attention) accounted for 8.82% of the variance, factor 3 (attitude towards contradiction) accounted for 7.97% of the variance, and factor 4 (perception of change) accounted for 6.22% of the variance. Table 2 presents factor loadings after rotation. Inspection of factor loadings revealed that two items had poor loadings: 1) “nothing is unrelated” translated as “nada está NO relacionado” (causality), and 2) “choosing a middle ground in an argument should be avoided” translated as “debe evitarse elegir un ‘punto intermedio’ en una discusión” (attitude towards contradiction). Moreover, the following three items had higher loadings on causality: 1) “current situations can change at any time” translated as “las situaciones actuales pueden cambiar en cualquier momento” (perception of change), 2) “it is not possible to understand the parts without considering the whole picture” translated as “no es posible entender las partes sin considerar ‘el cuadro’ entero” (locus of attention), and 3) “we should consider the situation a person is faced with, as well as his/her personality, in order to understand one's behavior” translated as “debemos considerar la situación que una persona afronta, así como su personalidad, para entender su comportamiento” (locus of attention).

We conducted a confirmatory factor analysis on the original 24-item AHS. We specified a four factor model with uncorrelated factor which yielded: $\chi^2(252) = 966.45, p < .001, \chi^2/df = 3.83$, Goodness of Fit Index (GFI) = .85, Confirmatory Factor Index (CFI) = .64, Root Mean Square Error of Approximation (RMSEA) = .07. These indices indicate that the model could be improved. Thus, we inspected modification indices and sequentially re-specified and re-estimated models until the best fitting model was identified. The following four items were associated with a large number of modification indices: 1) “debe evitarse elegir un ‘punto intermedio’ en una discusión” (attitude towards contradiction), 2) “las situaciones actuales pueden cambiar en cualquier momento” (perception of change), 3) “no es posible entender las partes sin considerar ‘el cuadro’ entero” (locus of attention), and 4) “debemos considerar

la situación que una persona afronta, así como su personalidad, para entender su comportamiento” (locus of attention). These four items were the same four (out of five) items that emerged as problematic during EFA. As a result of this converging evidence, we re-specified the model by removing these four items. The re-specified model yielded: $\chi^2(170) = 475.22, p < .001, \chi^2/df = 2.79, GFI = .92, \text{Confirmatory Factor CFI} = .80, \text{RMSEA} = .06$. These indices indicated that the model could be improved further. Modification indices revealed a significant drop in discrepancy if the model was re-specified to include six additional parameters: 1) a covariance between the items “es mas deseable adoptar un punto intermedio que ir a los extremos” and “debemos evitar ir a los extremos,” both of the attitude towards contradiction factor, and 2) covariances between factors, except a covariance between the factors causality and perception of change. Results yielded: $\chi^2(164) = 267.60, p < .001, \chi^2/df = 1.63, GFI = .95, CFI = .93, \text{RMSEA} = .03$, indicative of good model fit.

We tested the final four factor model against other plausible models: three, two, and one factor models. These models were hypothesized as plausible in light of the high interfactor correlations observed in both EFA and CFA which may suggest that a model with less than four factors may explain the data better. We specified the alternative models by sequentially removing each latent factor (attitude towards contradiction first, perception of change second, and locus of attention third) and specified items from removed factors to load on the causality factor. Thus, we compared the modified four factor solution against a three factor solution: $\chi^2(167) = 622.14, p < .001, \chi^2/df = 3.72, GFI = .88, CFI = .70, \text{RMSEA} = .07$, a two factor solution: $\chi^2(168) = 841.48, p < .001, \chi^2/df = 5.00, GFI = .84, \text{RMSEA} = .09$, and a one factor solution: $\chi^2(169) = 912.44, p < .001, \chi^2/df = 5.40, GFI = .83, \text{RMSEA} = .09$. A chi-square difference test revealed that the four factor model fit the data better $\chi^2(3) = 354.54, p < .001$ than a three factor model, a two-factor model $\chi^2(4) = 573.86, p < .001$, and one factor model $\chi^2(5) = 644.84, p < .001$. Reliability estimates for the modified 20 item scale were: AHS ($\alpha = .77$), causality ($\alpha = .71$), attitude towards contradiction ($\alpha = .62$), perception of change ($\alpha = .56$), and locus of attention ($\alpha = .68$).

Discussion

Study 1 indicated that the theorized four factor structure was replicated in Mexicans. Findings from EFA and CFA converged by yielding the same four items as problematic. The items “no es posible entender las partes sin considerar ‘el cuadro’ entero, and “debemos considerar la situación que una persona afronta, así como su personalidad, para entender su comportamiento” loaded highly on the causality factor. Upon closer inspection of the meaning of these two items, we came to the conclusion that they could also be measuring the belief that behavior, and any phenomenon, has multiple causes which is precisely what the causality factor attempts to capture. The items “debe evitarse elegir un ‘punto intermedio’ en una discusión” and “nada está NO relacionado” --the latter emerged as problematic only in EFA-- may have posed interpretation challenges due to negatives. The item “las situaciones actuales pueden cambiar en cualquier momento” may be devoid of meaning because the stem “las situaciones” is too general. A reference to a particular situation may have improved meaning. Lastly, the items “es mas deseable adoptar un punto intermedio que ir a los extremos” and “debemos evitar ir a los extremos” are very close in meaning hence, the strong multicollinearity observed.

Study 2: The Cross-Cultural Variation of Holistic Reasoning

Method

The purpose of study 2 was to investigate whether Mexicans, compared to U.S. Americans, exhibit a stronger preference for holistic thinking. To explore this hypothesis, we tested the

measurement invariance of the final four factor model that yielded the best indices of fit in Study 1. We compared the means obtained from the sample of Mexican participants on whom we performed CFA (Study 1) against mean scores from a sample of U.S. Caucasian American participants.

Participants—The Mexican group included 518 students (72% females) with a mean age of 22.13 ($SD = 5.69$). The U.S. American group included 97 students (63% females) with a mean age of 22.88 ($SD = 7.77$).

Measures—All participants answered a basic demographics questionnaire and the AHS.

Results and Discussion

The model obtained during CFA in Study 1 served as the baseline model. Testing of the unconstrained baseline model in multigroup analyses yielded: $\chi^2(328) = 510.34, p < .001$, $\chi^2/df = 1.55$, GFI = .93, CFI = .90, RMSEA = .03. After all parameters were constrained for equality across the groups we obtained a $\chi^2(66) = 580.17, p < .001$. A chi-square difference test revealed that the model was not invariant across groups $\chi^2(26) = 69.83, p = .03$. We sequentially re-specified and re-estimated models as recommended by Byrne (2001) to identify the source of invariance¹. Results indicated the following three items were non-invariant across groups: 1) “todo en el mundo esta entrelazado en una relacion causa-efecto” (causality) 2) “es deseable estar en armonia, en vez que en discordia, con otros que tienen opiniones diferentes a la propia” (attitude towards contradiction), and 3) “debemos evitar ir a los extremos” (attitude towards contradiction). We re-specified the model by freeing these items. The model yielded: $\chi^2(341) = 528.00, p < .001$. A chi-square difference test revealed that the model was invariant across groups $\chi^2(13) = 17.66, p = .17$.

A MANOVA was computed on the AHS and its four subscales--composed of the items that were deemed to be invariant across the groups-- with culture as the between-subjects factor. Results yielded significant multivariate results for culture Wilks' $\lambda = 7.14, p < .001, \eta^2 = .04$. In terms of individual subscales, significant effects were detected for attitude towards contradiction, $F(1, 616) = 11.72, p < .01$, Mexican participants had a higher mean score ($M = 5.05, SD = 1.05$) than U.S. Americans ($M = 4.66, SD = .97$), ($d = .38$), perception of change $F(1, 616) = 6.36, p < .05$, contrary to expectations, U.S. Americans had a higher mean score ($M = 4.21, SD = .93$) than Mexican participants ($M = 3.93, SD = 1.02$), ($d = .27$), and locus of attention, $F(1, 616) = 4.36, p < .05$, Mexican participants had a higher mean score ($M = 4.17, SD = 1.25$) than U.S. Americans ($M = 3.88, SD = 1.31$), ($d = .23$). Non-significant differences were detected for causality, Mexicans ($M = 5.23$) vs U.S. Americans ($M = 5.32$), and for the full AHS (4.59 vs 4.52 for Mexicans ($M = 4.59$) vs U.S. Americans ($M = 4.52$). A comparison of these means with the means reported by Choi, Koo, and Choi (2007)² seem to suggest a close resemblance between Mexicans and Koreans only in the attitude towards contradiction and causality factors.

General Discussion

Our goal was to initiate a line of research to understand the generalizability of the construct of holistic reasoning in Mexicans, an underrepresented population in cognitive cross-cultural

¹Byrne (2001) recommends testing models progressively to identify the source of invariance by first constraining for equality all the items of one factor at a time and freeing all other parameters. If indices of fit indicate that items belonging to one factor vary across groups one should re-specify and re-estimate models constraining one item per factor at a time. Those items that yield estimates indicative of invariance should be retained and constrained for equality.

²Means reported by Choi, Koo, & Choi (2007) for Koreans ($N = 104$) (causality = 5.48, attitude towards contradiction = 4.99, perception of change = 5.01, locus of attention = 5.16, AHS = 5.16) and for U.S. Americans ($N = 87$) (causality = 5.06, attitude towards contradiction = 4.68, perception of change = 4.72, locus of attention = 4.82, AHS = 4.82).

research. Study 1 identified problematic items but indicated that the theorized four factor structure fits the data in Mexicans. Results of Study 2 indicate that Mexican participants scored higher and in the expected direction than U.S. Americans but only in the causality and attitude towards contradiction factors. In addition, when comparing our means with the means reported by Choi, Koo, and Choi (2007) it appears that Koreans scored higher than Mexicans on all subscales except causality and contradiction. The findings of Study 2 are puzzling. One possibility may be that holistic reasoning in Mexicans is composed of causality and attitude towards contradiction only. Significant mean differences as a function of gender seem to support this notion as well. Another possibility may have to do with the population from which the U.S. American sample was selected. The population may not be representative of U.S. Caucasian Americans. The sample was derived from the state of Utah, where a majority affiliates with the religion of the Latter Day Saints. It is possible that results may vary if the study is conducted with a population located in other U.S. states.

Our study had several limitations. First, our procedure was entirely exploratory. Although we conducted CFA, we re-specified and re-estimated models. MacCallum and Austin (2000) suggest that a main problem associated with specifying and re-specifying paths is the possibility that such a strategy may lead two independent researchers to obtain results supporting alternate models. We deemed this approach as necessary since to our knowledge our study is among the first to attempt to understand the construct of holistic reasoning in Mexicans. Thus, we did not have a priori hypothesis regarding plausible differences and thus allowed modification indices to guide our model re-specifications. Second, to understand mean differences between Mexicans and U.S. Americans we assessed measurement invariance. This analysis yielded three items as non-invariant. Thus, we conducted mean score group comparisons on scales composed of a smaller number of items. Although we found some mean differences in the expected direction, we are unable to rule out the alternative possibility that mean differences may be driven by issues of low reliability. Third, we selected to use a maximum likelihood estimator which is more appropriate for interval or ratio-type variables. Wirth and Edwards (2007) indicate that variations of the maximum likelihood estimator, which limit the information used in the estimation, may be more appropriate for ordinal-type variables (e.g., Likert-type scales) and lead to more stable parameter estimates.

For future research, we would like to advocate the use of an emic strategy similar to the one used by Ramirez-Esparza (2007). It has often been the case that results from instrument validation research indicate that an instrument is ready to be applied in culturally and linguistically diverse populations (e.g., NEO personality inventory) with one caveat, an important emic aspect of that construct is not captured by the instrument (Cheung et al., 1996; 2001) Thus, future research should concentrate on uncovering the specifics of holistic reasoning as they pertain to Mexican and perhaps other Latin American cultures. We would like to also advocate for the validation of the AHS in Hispanics living in the U.S. Cross-language comparison between Mexicans and Mexican-Americans may allow us to better understand the construct of holistic reasoning in members of cultural groups positioned between the East and West and the way holistic reasoning may change as a function of culture change or acculturation.

There is a pressing need to contribute to the advancement of psychological research in Latin America (see Diaz-Guerrero, 2004). There are few studies on the effect of culture on the cognitive processes of Mexicans and South Americans in particular. We wished to contribute by translating into Spanish a measure that may facilitate cross-cultural cognitive research in Hispanics. We hope that our study will spark interest in advancing our understanding of holistic reasoning in Hispanics.

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Table 1**The 24-item English Analism-Holism Scale**

Items	
Causality	
1	Everything in the universe is somehow related to each other.
2	Nothing is unrelated.
3	Everything in the world is intertwined in a causal relationship.
4	Even a small change in any element of the universe can lead to significant alterations in other elements.
5	Any phenomenon has numerous number of causes, although some of the causes are not known.
6	Any phenomenon entails a numerous number of consequences, although some of them may not be known.
Locus of Attention	
1	The whole, rather, than its parts, should be considered in order to understand a phenomenon.
2	It is more important to pay attention to the whole rather than its parts.
3	The whole is greater than the sum of its parts
4	It is more important to pay attention to the whole context rather than the details.
5	It is not possible to understand the parts without considering the the whole picture.
6	We should consider the situation a person is faced with, as well as his/her personality, in order to understand one's behavior.
Attitude Towards Contradiction	
1	It is more desirable to take the middle ground than go to extremes.
2	When disagreement exists among people, they should search for ways to compromise and embrace everyone's opinions.
3	It is more important to find a point of compromise than to debate who is right/wrong, when one's opinion conflict with other's opinions.
4	It is more desirable to be in harmony, rather than in discord, with others of different opinions than one's own.
5	Choosing a middle ground in an argument should be avoided.
6	We should avoid going to extremes.
Perception of Change	
1	Every phenomenon in the world moves in predictable directions.
2	A person who is currently living a successful life will continue to stay successful.
3	An individual who is currently honest will stay honest in the future.
4	If an event is moving toward a certain direction, it will continue to Move toward that direction.
5	Current situations can change at any time.
6	Future events are predictable based on present situations.

Table 2**The 24-item Spanish Analism-Holism Scale**

Items	1	2	3	4
Factor 1: Causality				
1. Todo el universo esta relacionado de alguna manera entre sí.	.60	.16	-.03	.03
2. Nada esta NO relacionado.	.16	.29	.21	.02
3. Todo en el mundo esta entrelazado en una relación causa-efecto.	.67	.09	.11	.04
4. Incluso un cambio pequeño en cualquier elemento del universo puede causar significantes alteraciones en otros elementos.	.70	-.03	.07	.00
5. Cualquier fenómeno tiene numerosas causas, aunque algunas de las causas no son conocidas.	.54	.11	.10	.03
6. Cualquier fenómeno implica un considerable numero de consecuencias, aunque algunas de ellas NO son conocidas.	.69	.10	.13	.02
Factor 2: Locus of Attention				
1. Se debe considerar 'el todo,' en vez de sus partes individuales, para entender un fenómeno	.17	.71	.00	.00
2. Es mas importante prestar atención 'al todo' que a sus partes individuales.	.03	.77	.05	.06
3. El todo es mas importante que la suma de todas sus partes.	.01	.62	.13	-.00
4. Es mas importante prestar atención al contexto entero que a los detalles individuales.	-.00	.71	.07	.04
5. No es posible entender las partes individuales sin considerar "el cuadro" entero.	.42	.37	.01	.15
6. Debemos considerar la situación que una persona afronta, así como su personalidad, para entender su comportamiento.	.58	-.01	.14	.03
Factor 4: Attitude towards Contradiction				
1. Es mas deseable adoptar un punto medio que ir a los extremos.	-.04	.14	.66	.03
2. Cuando existe un desacuerdo entre las personas, estas deberían buscar la manera de comprometerse y abrazar las opiniones de todos.	.28	.06	.54	.00
3. Cuando la opinión de uno esta en conflicto con la opinión de otro, es mas importante encontrar un punto en común que debatir, a quien esta equivocado o tiene la razón.	.23	.03	.69	-.07
4. Es deseable estar en armonía, en vez que en discordia, con otros que tienen opiniones diferentes a la propia.	.36	.11	.43	-.02
5. Debe evitarse elegir un "punto intermedio" en una discusión.	-.01	.14	-.20	.29
6. Debemos evitar ir a los extremos	.00	.08	.65	.16
Factor 3: Perception of Change				
1. Todo fenómeno en el mundo se mueve en direcciones predecibles.	.08	.10	-.04	.31
2. Una persona que actualmente esta viviendo una vida exitosa, continuara siendo exitosa.	-.09	-.04	.09	.77
3. Un individuo que actualmente es honesto, será honesto en el futuro.	.04	-.06	.17	.69
4. Si un elemento se mueve en cierta dirección, seguirá moviéndose hacia esa misma dirección.	-.08	.00	.08	.75
5. Las situaciones actuales pueden cambiar en cualquier momento.	.66	-.03	.10	.01
6. Los eventos futuros son predecibles si se basan en eventos presentes.	.14	-.00	-.02	.23

Table 3

Correlations among the Four Factors of the Analism-Holism Scale

	1	2	3	4
1. Causality				
2. Contradiction	.36**			
3. Change	.17**	.21**		
4. Attention	.37**	.30**	.12**	
5. AHS	.72**	.70**	.53**	.70**

Note. Factors are composed of the original items. Correlations were computed on the sample used for EFA. AHS = total scale score.

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p < .01.

*
p < .05.