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COGNITIVE STYLES IN AN INTERNATIONAL PERSPECTIVE: CROSS-VALIDATION OF THE COGNITIVE STYLE INDICATOR

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ABSTRACT

This study aims to examine the cross-cultural validity of the Cognitive Style Indicator (CoSI). Measurement equivalence analyses were performed on data collected from a Belgian sample of students and employees (n = 300) and from an equivalent South-African sample (n = 246). Confirmatory factor analyses within each sample showed the best fit to the data for a three-factor model underlying the CoSI. Measurement invariance tests, using multigroup confirmatory factor analysis, indicated that the relationships among the scale items were equivalent across cultures. Finally, in addition to traditional measurement equivalence tests, a nomological net has been investigated. A comparison of the correlations between cognitive styles and personality yielded partial measurement equivalence, with no significant differences between the two samples for 11 out of the 15 correlations. Overall, the study supports the cross-cultural validity of the CoSI, although further research in other international samples is particularly needed to strengthen these results.

Keywords: Cognitive styles, cross-cultural research, Cognitive Style Indicator, measurement equivalence

INTRODUCTION

Cross-cultural business exchanges are increasingly the norm rather than the exception in the contemporary world of work (Leung, Bhagat, Buchan, Erez, & Gibson, 2005). This globalization is not only apparent in the business world itself, but also in management education (Friga, Bettis, & Sullivan, 2003). Due to this globalized business and education context, instruments are increasingly used in international environments, which makes an investigation of the cross-cultural validity of these questionnaires highly pertinent. Based upon these observations, the aim of this study is to investigate the reliability and validity of the recently developed Cognitive Style Indicator (Cools & Van den Broeck, 2007) in diverse cultural settings.

Cognitive styles have been defined as the way people perceive stimuli and how they use this information to guide their behavior (i.e., thinking, feeling, actions) (Hayes & Allinson, 1998). Cognitive styles are extensively studied in diverse research domains because they are considered to be the missing link between cognition and personality (Grigorenko & Sternberg, 1995; Riding & Rayner, 1998). Although scholars have identified a large variety of cognitive style models (Kozhevnikov, 2007), they have mainly focused on the distinction between analytic and intuitive thinking (Hodgkinson & Sadler-Smith, 2003). However, results of empirical research on the relationship between different cognitive style measures suggested that cognitive style is a complex variable with multiple dimensions (e.g., Leonard, Scholl, & Kowalski, 1999; Sadler-Smith, Spicer, & Tsang, 2000).

Building further on the debate on the unidimensionality of cognitive style models and the dichotomized and bipolar thinking in much cognitive style research, Cools and Van den Broeck (2007) examined whether reducing the concept of cognitive style to one bipolar dimension is still warranted. These authors developed and validated a cognitive style model and instrument – the Cognitive Style Indicator (CoSI) – that is a refinement of the analytic–intuitive cognitive style dimension by distinguishing between a knowing and a planning style on the analytic pole. Their research suggests that it is worthwhile to make a distinction between three cognitive styles (a knowing style, a planning style, a creating style), which initially stem from the traditional conceptualization of the bipolar analytic–intuitive cognitive style dimension, without further framing them conceptually in a single dimension. These authors believe in a more flexible approach in which people can simultaneously score high or low on several styles, which fits the recent calls to establish a more flexible point of view in style research (Hodgkinson & Sadler-Smith, 2003; Miron, Erez, & Naveh, 2004).

Summarizing previous research with this new instrument (Cools, 2008; Cools & Van den Broeck, 2007; 2008a; 2008b; Cools, Van den Broeck, & Bouckenooghe, 2009), it has been found that people who score high on the *knowing style* prefer a logical, rational, and impersonal way of information processing, have strong analytical skills, and a good logical reasoning. They search for accuracy and like to make informed decisions on the basis of a thorough analysis of facts and figures and rational arguments. People scoring high on the *planning style* are attracted by structure and control, they search for certainty, and prefer a well-organized environment. Planners like to make decisions in a structured way and are mostly concerned with the efficiency of the process. They are self-disciplined, reliable, habit-bound, and tend to be resistant to change and rather closed to new ideas. People who score high on the *creating style* search for renewal, are attracted by new ideas, and have a strong imagination. They like to work in a flexible and spontaneous way and have a preference for a creative and unconventional way of decision making. Creating people tend to make decisions primarily based on intuition or 'gut-feeling', using objective information and data only in a second phase.

Importantly, when considering the evidence for the construct validity of the CoSI so far, it is worth noting that the samples in these previous studies mainly incorporated Western respondents. In order to use a psychological construct in an international context, it is generally accepted that one should verify if the meaning is invariant, or at least similar, across different cultures (Cheung, Leung & Au, 2006). From a methodological perspective, measurement equivalence is required in order to validly apply an instrument in other cultures (Schmitt & Kuljanin, 2008; Vandenberg & Lance, 2000). Therefore, this study examines the measurement equivalence of the CoSI by applying configural and metric invariance tests through confirmatory factor analyses. Beside traditional measurement equivalence tests as indicators for construct validity, a nomological network across both cultures has been studied (Oreg et al., 2008). The relationship of cognitive styles with the well-established Big Five personality traits has been investigated for two main reasons. First, personality can be theoretically linked to cognitive styles (Collis & Messick, 2001; Zhang & Sternberg, 2006). Various style scholars agree that cognitive styles are a bridge construct that brings notions of information processing and personality together (Hodgkinson & Sadler-Smith, 2003; Sternberg & Grigorenko, 1997). Second, the five-factor personality model has been studied widely in various cultures (Furnham, 2008a; McCrae & Allik, 2002). According to Furnham (2008a) there is impressive evidence that this five-factor model is consistent across cultures.

METHOD

Samples

South-African respondents. A total of 268 South-African respondents participated in this study, yielding 246 useful questionnaires. This sample consisted of 86 employees and middle-managers of a reputable South-African bank and 160 management students of a large-scale South-African university. The mean age of these respondents was 25.4 years (SD = 8.37), ranging from 17 to 58. Thirty-seven percent were men, and 63 % were women.

Belgian respondents. For comparability reasons, a random sample of 300 management and MBA students has been selected from a larger database from a leading Belgian business school. Of this sample, 199 participants were full-time Master in management students, while 101 of them were employees who followed a part-time MBA program. Participants' ages ranged from 21 to 44 years (M = 26.3, SD = 5.04 years). Seventy-six percent were men, and 24 % were women.

Measures and Procedure

Data were collected through self-report questionnaires. All students completed the instruments in a classroom environment in the context of a management and organization course, while employees completed them in their professional work setting. Given the eleven official languages in South-Africa (Smit & Van Greunen, 2008), translating the questionnaires for the South-African respondents might have been a problem. However, since English is the common language for these respondents, administering English versions of all measures in both the South-African and the Belgian sample provided the best option for preserving semantic equivalence (Schaffer & Riordan, 2003).

Cognitive styles. Cognitive styles were assessed with the 18-item Cognitive Style Indicator (Cools & Van den Broeck, 2007), which measures individual differences with regard to how people perceive, process, and structure information. It uses a five-point Likert scale format from 1 ('typifies me not at all') to 5 ('typifies me completely'), and distinguishes a knowing style (4 items, e.g., 'I like to analyze problems'), a planning style (7 items, e.g., 'I prefer clear structures to do my job'), and a creating style (7 items, e.g., 'I like to extend the boundaries').

Previous research with the CoSI in various Western samples supported the construct validity of the instrument and reliability, item, and factor analyses in each of these studies confirmed the internal consistency and homogeneity of the three cognitive styles (Cools, 2008; Cools & Van den Broeck, 2007; 2008a; 2008b; Cools et al., 2009).

Personality. The Big Five personality traits (i.e., Extraversion, Agreeableness, Emotional Stability, Conscientiousness, and Openness to Experience) were measured with the Single-Item Measures of Personality (SIMP) of Woods and Hampson (2005), which is a recently validated questionnaire using five bipolar single items. Each item consists of two opposing descriptions representing the poles of one of the Big Five factors, using a nine-point Likert scale format. Woods and Hampson (2005) reported good psychometric qualities for the SIMP for research purposes. In a recent study that investigated the relationship between four personality measures of different length, Furnham (2008b) found positive evidence to choose brief measures to assess personality for reasons of parsimony and efficiency.

ANALYSES AND RESULTS

We first report on the within-sample confirmatory factor analyses (CFA), before moving on to the multigroup CFA procedure and the comparison of the nomological networks across the samples.

Within-Sample Confirmatory Factor Analyses

For reasons of completeness, Table 1 summarizes the means, standard deviations, average inter-item correlations, item-total correlations, and the factor loadings of the exploratory factor analyses (EFA) of the two samples. As can be seen in Table 1, item C7 had a primary factor loading lower than the 0.40 cut-off in the South-African sample. It has been discarded from further analyses, as it also showed lower factor loadings in the initial validation studies of the CoSI (Cools & Van den Broeck, 2007). This was the only negatively worded item in the instrument and other scholars also found that negatively worded items often lead to different responses and have a differential effect across cultures (Lai & Yue, 2000; Schmitt & Allik, 2005). Item P6 also had a factor loading lower than 0.40 in the South-African sample, but as this item had good factor loadings in previous studies with the CoSI (Cools, 2008; Cools & Van den Broeck, 2007; 2008a; 2008b; Cools et al., 2009), we decided to keep it.

The Cronbach alpha coefficients for the three scales were 0.76 and 0.77 for the knowing style, 0.86 and 0.84 for the planning style, and 0.81 and 0.72 for the creating style in the Belgian and South-African sample respectively.

Insert Table 1 About Here

As a first step in establishing measurement equivalence, we conducted confirmatory factor analyses to test the factor structure of the CoSI within each sample. Three alternative CFA models were tested: a single-factor model (i.e., all CoSI items loading on one common factor), a two-factor model (i.e., knowing and planning items loading on factor one, and creating items on factor two), and a three-factor model (i.e., knowing items loading on factor one, planning items loading on factor two, and creating items loading on factor three). As a myriad of fit indices and criteria for determining good fit are available, a consensus on the acceptability of a model should be formed on the basis of examination of the results of a variety of fit indices (Hair, Black, Babin, Anderson, & Tatham, 2006; Kline, 2004).

Insert Table 2 About here

The three-factor model showed an acceptable fit to the data in the Belgian and the South-African sample (see Table 2). For the Belgian sample, $\chi^2(116) = 265.99$ and $(\chi^2/\underline{df}) = 2.29$, which is well within the boundaries of 2.0 and 5.0. The GFI equals the 0.9 cut-off. The RMSEA was also acceptable with a value of 0.066, which is below the 0.08 criterion. The CFI equals 0.92, which is above the recommended criterion level of 0.9. Similar results were found for the South-African sample: $\chi^2(116) = 233.86$; $(\chi^2/\underline{df}) = 2.02$; GFI = 0.90; RMSEA = 0.064; and CFI = 0.91.

An examination of the fit indices of the two-factor and one-factor models (see Table 2) showed that only a few of the indices fell within the recommended criteria levels. The fit for the two-factor model was neither acceptable for the Belgian sample ($\chi^2(118) = 468.33$; $(\chi^2/\underline{df}) = 3.97$; GFI = 0.83; RMSEA = 0.1; CFI = 0.80) nor for the South-African sample ($\chi^2(118) = 302.48$; $(\chi^2/\underline{df}) = 2.56$; GFI = 0.87; RMSEA = 0.080; CFI = 0.87).

Looking at the one-factor model, the values of the fit indices indicated a lack of fit in both countries. The results for the Belgian sample were: $\chi^2(119) = 930.39$; $(\chi^2/df) = 7.82$; GFI = 0.66; RMSEA = 0.151; and CFI = 0.54. The fit indices of the South-African sample were: $\chi^2(119) = 389.10$; $(\chi^2/df) = 3.27$; GFI = 0.82; RMSEA = 0.096; and CFI = 0.80. Overall, the three-factor model showed the best fit to the data as compared to the alternative factor structures in the Belgian and the South-African sample. This confirms the previous results of Cools (2008).

Multigroup Confirmatory Factor Analyses

After testing model fit in both samples separately, multigroup CFA (using AMOS version 7) has been conducted to examine whether the items and the underlying constructs mean the same to members of the two samples (Schmitt & Kuljanin, 2008; Vandenberg & Lance, 2000). Following a procedure applied in other cross-cultural research (e.g., Grouzet et al., 2005; Oreg et al., 2008), two invariance tests have been conducted across the two samples: first, a test of configural invariance in which the configuration of relationships between items and latent variables across samples is examined and second, a test of metric invariance in which the constraint of equal factor loadings is added. According to Cheung and Rensvold (2002), ΔCFI can be used as an index of difference in fit, as it is not prone to the effect of sample size as opposed to $\Delta\chi^2$. These authors determined that changes in CFI of more than 0.01 indicate a significant drop in fit.

The first test, which examines factor form invariance, resulted in a good fit for this model across the two samples: $\chi^2(232) = 499.85$; $(\chi^2/df) = 2.155$; GFI = 0.90; RMSEA= 0.046; and CFI = 0.91. In the second test, which tested a model with equal factor loadings, we constrained the factor loadings of the items to be equal across the samples. This additional set of constraints did not produce a significant drop in fit (ΔCFI = 0.01). The fit indices were: $\chi^2(246) = 538.92$; $(\chi^2/df) = 2.191$; GFI = 0.90; RMSEA = 0.047; and CFI = 0.91. Overall these two tests indicated measurement invariance across the two samples.

Nomological Network Comparisons

To test for the equivalence in the construct's meaning in yet another way, we compared the pattern of relationships between cognitive styles and personality across the two samples. Table 3 summarizes the pearson-product moment correlations of the three CoSI subscales with the three SIMP subscales. Confirming previous research on the link between cognitive styles and personality (Cools & Van den Broeck, 2007; Jacobson, 1993; Järlström, 2000; Judge & Cable, 1997), we found positive correlations between the cognitive styles and some of the personality traits. The creating style correlated positively with openness to experience ($\underline{r} = 0.53$, $\underline{p} < 0.001$ in the Belgian sample; $\underline{r} = 0.15$, $\underline{p} < 0.05$ in the South-African sample). The knowing style correlated positively with conscientiousness ($\underline{r} = .15$, $\underline{p} < 0.10$ in the Belgian sample; $\underline{r} = 0.19$, $\underline{p} < 0.01$ in the South-African sample) as well as the planning style ($\underline{r} = 0.67$, $\underline{p} < 0.001$ in the Belgian sample; $\underline{r} = 0.24$, $\underline{p} < 0.001$ in the South-African sample). Comparing the correlations of the two countries (Raghunathan, Rosenthal, & Rubin, 1996), we found a similar pattern of relationships between the different constructs, with 11 out of the 15 correlations showing no significant differences.

Insert Table 3 About here

CONCLUSION

The study investigated the cross-cultural validity of the Cognitive Style Indicator through confirmatory factor analyses in two different samples. The results confirmed the existence of a similar factor structure within the Belgian and South-African sample, yielding the best fit to the data for the three-factor model. Multigroup CFA, examining whether the items and underlying constructs had the same meaning to people of the two samples, indicated measurement invariance, implying that the CoSI measures the same construct across the two different cultural samples. Studying the nomological network, we found a similar pattern of relationships between the three CoSI subscales and the five SIMP subscales across the two samples, with no significant differences for 11 of the 15 correlations. Overall, this study indicates that the Cognitive Style Indicator evokes equivalent meanings across the two nations and can be reliably and validly used in these two countries.

However, some limitations of this study should also be noted. The challenge of any research project, but far more for cross-cultural studies than for unicultural studies, is to be aware of any possible (unmeasured or uncontrolled) factors that might bias the results (Gelfand, Raver, & Ehrhart, 2002; Keillor, Owens, & Pettijohn, 2001). In this sense, the study needs to be considered a first attempt to validate the Cognitive Style Indicator in another cultural setting. Further research is needed to replicate the findings of this study in other countries.

In addition, respondents from various cross-cultural samples can have different experiences with measurement instruments and with testing procedures in general. According to Lonner (1990), Western people are rather familiar with survey instruments compared to other cultures. As a consequence, prior exposure to testing instruments and a different comfort level filling out questionnaires can have an influence on the item responses. This way, the obtained results can be affected. The results of the measurement invariance tests from this study were encouraging, but again further research in other samples and using diverse research methods are particularly needed. As Gelfand and colleagues (2002) quite rightly argue, a construct that seems universal across cultures might manifest itself differently in different cultures and lead to behaviors that vary significantly across cultures. Self-reporting questionnaires have the advantage of being an efficient, cost effective, and easy to use tool to collect data, but the disadvantage is that they rely on people's ability to introspect themselves accurately and without notions of social desirability (Keillor et al., 2001). Hence, striving towards multiple sources of data and a mixture of qualitative and quantitative research methods can significantly enhance the cross-cultural understanding of cognitive style differences and strengthen the validity of our findings (Creswell, 2003).

A final issue we want to mention is linked to the use of country as an indicator of culture. The terms 'country' and 'culture' do not always overlap. The specific identity of a country usually contains more than one subculture (Peterson & Smith, 1997), which is particularly the case for the South-African 'rainbow nation' (Smit & Van Greunen, 2008). According to Schaffer and Riordan (2003) within-country differences can be greater than between-country differences for some variables. Although we used proximity as a cultural determinant (Peterson & Smith, 1997) – with all participants belonging to one university and one organization – it might be interesting to study different ethnic groups within a country.

To conclude, given the positive results of this first cross-cultural study with the recently validated Cognitive Style Indicator, further cross-cultural, mixed-method, and longitudinal research with this instrument is needed to provide answers to the still unresolved

issue about the extent of stability or malleability of cognitive styles across situations and cultures (Allinson & Hayes, 2000; Hill, Puurula, Sitko-Lutek, & Rakowska, 2000). The interest in the potential external factors (such as culture, education, socialization, social environments) that might affect style differences fits into the debate about whether styles are biologically based, the result of early learning, lifelong learning, all of these, or none of these (Furnham, 1995). Given the increasingly globalized business and education context, more cross-cultural research is necessary to provide insight in the degree of universality versus cultural-specificity of cognitive styles and to give people and organizations practical solutions to deal with the management of cultural differences and dynamics (Gelfand et al., 2002).

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TABLE 1

Means, Standard Deviations, Average Inter-Item Correlations, Item-Total Correlations, and Factor Loadings for the Cognitive Style Indicator (CoSI)

	Belgian Sample (n = 300)						South-African Sample (n = 246)					
Item	M	SD	Item-total	Factor 1	Factor 2	Factor 3	M	SD	Item-total	Factor 1	Factor 2	Factor 3
Knowing Style	3.68	0.69	(0.44)				3.87	0.71	(0.45)			
K1. I want to have a full understanding of all problems.	3.71	0.89	0.57	−0.06	0.01	**−0.73**	4.02	0.95	0.57	0.21	0.26	**−0.42**
K2. I like to analyze problems.	3.82	0.86	0.54	0.01	−0.06	**−0.59**	4.04	0.92	0.57	0.11	−0.19	**−0.76**
K3. I make detailed analyses.	3.32	0.95	0.56	0.23	−0.04	**−0.59**	3.54	0.98	0.62	0.11	0.03	**−0.65**
K4. I study each problem until I understand the underlying logic.	3.89	0.94	0.55	−0.02	0.08	**−0.70**	3.89	0.89	0.50	−0.02	0.20	**−0.49**
Planning Style	3.48	0.73	(0.47)				4.09	0.65	(0.42)			
P1. Developing a clear plan is very important to me.	3.64	0.97	0.71	**0.80**	0.10	0.004	4.11	0.95	0.63	**0.48**	0.07	−0.32
P2. I always want to know what should be done when.	3.31	1.09	0.58	**0.62**	−0.09	0.02	4.13	0.91	0.54	**0.51**	0.08	−0.11

P3. I like detailed action plans.	3.28	0.96	0.73	**0.80**	−0.003	−0.002	4.11	0.91	0.64	**0.64**	0.14	−0.07
P4. I prefer clear structures to do my job.	3.27	1.04	0.65	**0.63**	−0.16	−0.10	4.13	0.88	0.65	**0.67**	0.07	−0.09
P5. I prefer well-prepared meetings with a clear agenda and strict time management.	3.91	0.99	0.63	**0.65**	−0.004	−0.06	4.27	0.91	0.65	**0.65**	0.10	−0.09
P6. I make definite engagements, and I follow up meticulously.	3.40	0.96	0.52	**0.54**	0.08	−0.14	3.69	0.92	0.40	**0.21**	0.18	−0.15
P7. A good task is a well-prepared task.	3.58	0.98	0.58	**0.66**	−0.01	0.07	4.19	0.92	0.65	**0.63**	0.12	−0.09
Creating Style	4.08	0.57	(0.39)				3.95	0.61	(0.28)			
C1. I like to contribute to innovative solutions.	4.06	0.81	0.52	0.16	**0.65**	0.02	4.11	0.84	0.53	0.21	**0.52**	−0.13
C2. I prefer to look for creative solutions.	3.82	0.91	0.65	−0.01	**0.75**	0.08	3.98	0.88	0.48	0.16	**0.46**	−0.12
C3. I am motivated by ongoing innovation.	3.95	0.80	0.69	0.004	**0.79**	0.06	3.96	0.87	0.49	0.08	**0.50**	−0.13
C4. I like much variety in my life.	4.39	0.68	0.47	−0.24	**0.42**	−0.05	4.05	0.95	0.45	0.08	**0.54**	0.03
C5. New ideas attract me more than existing solutions.	4.00	0.83	0.65	−0.06	**0.73**	0.03	3.80	0.92	0.48	−0.05	**0.56**	−0.07
C6. I like to extend boundaries.	4.28	0.71	0.49	0.06	**0.56**	−0.08	3.78	1.01	0.42	0.04	**0.59**	0.14
C7. I try to avoid routine.	3.74	1.00	0.44	−0.18	**0.41**	−0.07	3.03	1.18	0.24	−0.38	**0.32**	−0.17

Note. Average inter-item correlations of scales are in parenthesis. Factor loadings of items within the scale are in bold face.

TABLE 2

Confirmatory Factor Analyses of the Cognitive Style Indicator (CoSI)

	χ^2	df	χ^2/df	GFI	CFI	RMSEA
Belgian Sample (n = 300)						
One-factor model	930.394	119	7.818	0.661	0.543	0.151
Two-factor model	468.331	118	3.969	0.828	0.803	0.100
Three-factor model	265.987	116	2.293	0.899	0.915	0.066
South-African Sample (n = 246)						
One-factor model	389.097	119	3.270	0.822	0.804	0.096
Two-factor model	302.477	118	2.563	0.869	0.866	0.080
Three-factor model	233.856	116	2.016	0.902	0.914	0.064

Note. χ^2 = chi-square, χ^2/df = normed chi-square, GFI = goodness-of-fit index, RMSEA = root mean square error of approximation, CFI = comparative fit index

TABLE 3

Pearson Product-Moment Correlations of Cognitive Style Indicator (CoSI) subscales and Single-Item Measures of Personality (SIMP) subscales

	Belgian Sample (n = 300)					South-African Sample (n = 246)				
	M	SD	Knowing	Planning	Creating	M	SD	Knowing	Planning	Creating
Extraversion	5.77	1.89	−0.16*	−0.02	0.08	5.02	2.27	−0.02	−0.05	0.13*
Agreeableness	5.25	1.73	−0.06	0.03	−0.02	6.23	1.98	0.12†	0.23**	0.22**
Emotional stability	4.75	1.81	0.003	−0.09	0.02	4.43	2.00	0.02	−0.15*	0.04
Conscientiousness	4.85	2.03	0.15†	0.67***	−0.39***	4.26	2.26	0.19**	0.24***	0.03
Openness	5.79	1.79	0.003	−0.30***	0.53***	5.71	2.01	−0.08	−0.11†	0.15*

Note. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.