



Individualism-Collectivism: A Brazilian-Portuguese Version of Triandis and Gelfand's Scale

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Abstract

Human values play an essential role in life, highlighting what is socially desirable and influencing people's actions. In order to deliver a way of measuring such construct, this work aimed to test the stability of the horizontal and vertical individualism and collectivism scale (HVIC) structure in Brazil through some of its states. Two studies were conducted. Study 1 presented the validation of the measurement tool replicating the original Triandis and Gelfand (1998) study, comparing similar samples in Brazil and the USA (undergraduate students; $N=200$ to each group). The structure found was similar in both countries, but the modification indexes suggest a change in one item load compared to the original study. Study 2 compared data from five Brazilian states, (blue-collar workers; $N=5,589$). Results revealed that the four-factor structure was well adjusted and showed minor differences between and within states. Practical and theoretical contributions were provided in particular for horizontal and vertical dimensions, in particular, challenging the horizontalism found in previous studies and suggesting other groups of references in Brazil.

Keywords Hofstede · Triandis · Measurement validation · Individualism-collectivism · Horizontal-vertical

Values refer to what is socially preferable by social actors, therefore influencing their actions (Markus et al., 1996; Rohan, 2000; Zavalloni, 1980). Although familiar, values as a concept are abstract placeholders for more concrete ideas. They involve

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explicit goals applied to encourage action that can explain and even justify people's attitudes toward social issues. In this regard, they also guide the preference and the adoption of solutions to certain human problems within society. The study of values involves the antecedents and the means of the decision-making for a chosen behavior (Fischer, 2019; Kristiansen & Zanna, 1994; Markus et al., 1996; Rohan, 2000; Schwartz, 1999; Torres et al., 2015). People's values emerge from their interaction and how ideas are transferred from one person to another. Thus, through socialization, cultural patterns are created and then internalized (Markus et al., 1996; Torres et al., 2015), reflecting the essential core of culture (Zavalloni, 1980).

Different survey approaches to the study of values and the diverse ways to assess them follow a theoretical and practical guideline insofar as they are linked to how values are conceptualized, and which aspects may be considered desirable (Zavalloni, 1980). On one hand, such strategy helps explaining individual differences (Smith & Bond, 2022). On the other hand, demonstrating equivalence in measurement becomes a methodological challenge for comparative research (Davidson & Thomson, 1980; Muthukrishna et al., 2020; Ratzlaff et al., 2000). Nevertheless, the measurement of values comprises the starting point for comparative research on culture (Fischer, 2019; Hofstede et al., 2010; Zavalloni, 1980).

Furthermore, cultural contexts have been studied through the lenses of individualism and collectivism constructs as well as literature that have been providing examples of such dimensions as a way to differentiate cultures (Bond et al., 2004; Braithwaite, 1982; Oyserman et al., 2002; Rohan, 2000; Shavitt et al., 2010). One example would be the advancement of Rokeach's roots of equality and freedom in the 1970s (Braithwaite, 1982). The independence of the self, communal antagonism, and social structures (e.g., social moorings) described individualism. In contrast, collectivism is related to the dependence and relation of the self. However, the structure of these constructs has been considered unclear, and some authors suggested that these dimensions could be poles of one unidimensional construct. Other authors portray individualism-collectivism as a bi-dimensional amalgamation of coexisting constructs (Cozma, 2011), while Triandis (2018) advocates for the coexistence of several types of individualism and collectivism, distinguishing between horizontal and vertical types.

Supplementing the individualism-collectivism measurement with other dimensions such as the horizontal-vertical dimensions can improve the accuracy of the approach (Shavitt & Cho, 2016; Torelli & Shavitt, 2010). The vertical and horizontal distinction refers to the relationship with authority, hierarchy, inequality, and power (Nelson & Shavitt, 2002; Torelli & Shavitt, 2010). Horizontal orientation emphasizes equality, while vertical orientation emphasizes hierarchy (Triandis, 2018). Four categories will emerge from crossing both dimensions, namely (a) horizontal individualism (HI); (b) vertical individualism (VI); (c) horizontal collectivism (HC), and (d) vertical collectivism (VC) (Singelis et al., 1995). Cultures described as HI reflect the independent but equally self-referenced people in which it is desirable to find overconfident, self-reliant, self-directed, and unique people. A VI culture refers to independent and unequal selves. It means that people's motivations are related to having high status and power compared to others. An HC culture involves people who perceive themselves as equal and dependent through sociability and kindness.

Conversely, people in a VC culture stand out for seeing themselves as unequal and dependent, hence their focus on social norms and the fulfillment of duties (Cozma, 2011; Györkös et al., 2013; Lalwani et al., 2006; Li & Aksoy, 2007; Nelson & Shavitt, 2002; Singelis et al., 1995; Triandis & Gelfand, 1998).

The Triandis and Gelfand (1998) horizontal and vertical individualism and collectivism (HVIC) scale was proposed to provide empirical support to the HVIC constructs beyond the theoretical outline. Previous research applying the HVIC scale has been carried out predominantly in the USA, comparing their constructs' scores with non-western (Oriental/Asian) samples. Other nations that presented similar collectivistic features are underrepresented (Smith et al., 2013; Torelli & Shavitt, 2010) or treated as aggregated regions (e.g., Latin America; Lenartowicz & Johnson, 2003; Oyserman et al., 2002).

Among the underrepresented nations is Brazil. There, one study tested the within-country stability of value structures using a functional theory of values (Fischer et al., 2011). It showed how problematic it can be to condense large and diverse countries such as Brazil as if it were a single homogenous culture in cross-cultural studies. Although Brazil has been considered a collectivist country in general (Torelli & Shavitt, 2010; Torres & Pérez-Nebra, 2007, 2015), there are substantial cultural differences between its geographic regions within its vast territory (Fischer et al., 2011; Torres et al., 2015).

Brazil is by far the largest country in Latin America and the 12th largest in the world, with an estimated population of 211.7 million inhabitants (IBGE, 2020a; World Bank, 2021a). The country has one of the world's most extensive gross domestic product (GDP) and has a significant disparity in average income and educational levels reflected by a GINI index equal to 53.4 (World Bank, 2021b), not to mention a highly heterogeneous human genomic (Kehdy et al., 2015) and ethnic diversity between its states due to its immigration history (Lenartowicz & Johnson, 2003). Thus, given its size and features, it is not strange to expect contrasting findings in studies since similar differences were found in studies such as the ones involving value perspectives (Fischer et al., 2011; Torres et al., 2015). Therefore, Brazil combines characteristics that make the country an exciting object of study (Bontempo et al., 1990; Torres et al., 2015).

The country is divided into five geographic regions (north, northeast, southeast, south, and center west), aggregating between three to nine states. Such regions can be very different in terms of average income, population density, ethnic composition, or human values (Torres et al., 2015). The northern and northeastern region's population is mainly comprised of indigenous and African descendants instead of a minority of European descendants (Handelman, 1931). Both regions are characterized by low income and educational levels (Pinheiro et al., 2015).

In contrast, the most populated part of the country, the southern and southeastern regions, received a hefty European and Asian immigrant influx between the end of the 19th and the beginning of the twentieth centuries (Guerra, 2012). The European immigration comprised predominantly Portuguese, Italian, German, Swiss, and Austrian people. The country has also received a representative contingent of Asian citizens, mostly Japanese (Batista et al., 2014; Kehdy et al., 2015; Schlesinger, 2010). The center western region, the least populated, has

harbored the country's capital since 1960, which was transferred there in the hope of fostering regional integration and economic growth (Bueno, 2010). Such characteristics provide an exciting ground for cross-cultural research based on combinations of individualist and collectivist dimensions (Green et al., 2005). Also, cultural research has suggested that it is possible to identify cultural differences by further geographic segmentation (Erez, 2010; Fischer et al., 2011; Hofstede et al., 2010; Smith et al., 2013; Torres et al., 2015).

The fact that there was no parsimonious scale to measure HVIC constructs in order to test and compare such a structure empirically was a problem. To the best of our knowledge, Torres (1999) was the first to compare the USA and Brazil samples applying the HVIC approach. Beyond that, a few other pieces of research offered validity evidence for the four-pattern structure in the Brazilian context (Gouveia et al., 2002; Torres & Pérez-Nebra, 2015). Thus, it is believed that evidence supports the construct and, at least partially, the structure. However, the proposed measures of HVIC are limited by the scale extension (e.g. Ferreira et al., 2006) and have little reliability in some factors (Torres & Pérez-Nebra, 2015).

In addition, some limitations can be highlighted in regard to the construct operationalization. Three studies have adapted the HVIC 16-item scale proposed by Triandis and Gelfand (1998). Györkös et al. (2012) and Li and Aksoy (2007) used the same scale proposed by the authors. Torres and Pérez-Nebra (2015) tried to adapt the scale culturally. These studies, using exploratory factor analysis, found different arrangements in the factor loadings compared to the original proposal, especially in the three items that we present in Table 1.

Therefore, additional studies are needed to ensure the measure's validity. Thus, this work aims to empirically test the stability of the HVIC structure in Brazil, using the short 16-item version of Triandis and Gelfand (1998) scale. Firstly, we sought to replicate the Triandis and Gelfand original scale in both a USA and a Brazilian sample, analyzing invariance across nations (Fischer et al., 2022). In addition, we compared two student samples—one from Brazil and the other from the USA (study 1). Secondly, we tested if the results could be replicated in the different Brazilian states (study 2). To do so, we carried out the specific procedures for construct measurement and comparison in cross-cultural research, as Smith et al. (2013) recommended.

Table 1 HVIC item saturation in different studies

Study	Sample	Item 4	Item 11	Item 16
Triandis & Gelfand, 1998	USA and Korea	HI	HC	VC
Györkös et al., 2012	Switzerland and South Africa	HI	HC	Could be in HC
Li & Aksoy, 2007	USA and Turkey	Removed	Removed	Re-specify to HC
Torres & Pérez-Nebra, 2015	Brazil	HI	Removed	Not included

HI, horizontal individualism; *HC*, horizontal collectivism; *VC*, vertical collectivism

Study 1

Study 1 aimed to replicate the Triandis and Gelfand (1998) original scale in both USA and Brazilian samples. We followed recommendations for cross-cultural studies (Smith et al., 2013).

Method

The study 1 method applied decentering translation, exploratory factor analysis (EFA), confirmatory factor analysis (CFA) with modification indices and equivalence tests (Davidson & Thomson, 1980; Fischer et al., 2022; Hirschfeld & Von Brachel, 2014; Milfont & Fischer, 2010; Neilands et al., 2018; Rosseel, 2019; Smith et al., 2013).

Participants

Two hundred students who attended the Illinois Urbana-Champaign and 200 students who attended the Centro Universitario de Brasilia, DF. Informed consent was obtained from all individual participants included in the study. 68.3% of the sample were female, with a mean age of 21.6 (median = 20,0; SD = 6.19) years old. Regarding racial groups, in Brazil, 49.0% were African American; followed by 37% Hispanic; 9% white, not Hispanic; 3% Asian; and 4% native indigenous. In the USA, 2% were African American; 38% white, not Hispanic; 5% Hispanic; 44.5% East Asian; 7% South Asian; 0.5% Native American; 2.5% multiracial; and 0.5 “other.” In Brazil, the primary language was 99.9% Portuguese and 0.5% French. In the USA, 59.5% had their primary language as English, followed by Chinese (29%), Korean (3.5%), Spanish (1.5%), mixed (e.g., Chinese and English, Hindi and English, and Spanish and English, 3%), and others (less than 1% of the sample). The criteria for choosing the sample in this study were to replicate the original work. Urbana-Champaign undergraduate students were the original Triandis and Gelfand (1998) data collection group, and a similar group in terms of age and academic undergraduate students was found in Brazil, in the Federal District, Brazil’s capital, to compare.

Instruments

The HVIC 16-item scale proposed by Triandis and Gelfand (1998) was re-translated and back-translated by two experts and two non-experts on the subject. Five experts in English and Brazilian-Portuguese reviewed the instrument, which was applied through a paper-and-pencil procedure. The process of translation and back translation, although important, is not enough to guarantee that items will be comprehensive and adequate for the culture. Thus, it is important to translate and check if the items make sense in the context and for the audience, an approach of decentering

(Smith et al., 2013). The scale is presented in one bloc of 16 items, and we asked for the respondents to describe how much they agree with the sentence on a scale of 1 to 9, where 1 means total disagreement and 9 is total agreement.

All procedures performed in this study were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (approved in CAAE: 54,945,416.6.0000.0023).

Data Analysis

EFA was carried out similarly to Triandis and Gelfand's original work (1998). We split the sample randomly into two parts. We conducted EFA (Statistical Package for Social Science version 20) using principle axis factor varimax rotation to the first half of the sample composed by the USA and Brazilian students, searching for the best solution configuration to check if it replicated the original factor solution. Triandis and Gelfand's first step was conducting an EFA using oblimin and Varimax rotation with similar results. Thus, as varimax is suggested by authors (e.g., Field et al., 2012) and in the original, we covered both criteria.

As a second step, we compared invariance measures with this structure to ensure equivalence. Equivalence refers to the measure that have comparable scores across cultures (van de Vijver & Tanzer, 2004). To achieve this, we conducted CFA and invariance analysis in the second half, also composed of the USA and Brazilian sample and compared their structure, estimated by maximum likelihood. To do so, we used R's statistical packages such as lavaan, semTool, and semPlot, tested the original structure and the structure suggested by the EFA, and then, we tested modification indices and invariance measures (Fischer et al., 2022; Hirschfeld & Von Brachel, 2014; Jorgensen et al., 2018; Lugtig & Hox, 2012; Milfont & Fischer, 2010; Rosseel, 2014; Smith et al., 2013; Tomás et al., 2014) and considered one way to conduct measurement invariance (Van de Schoot et al., 2015).

Results

Table 2 shows the factor loadings obtained. The EFA generated a factor structure almost identical to the previous findings (Li & Aksoy, 2007; Triandis & Gelfand, 1998) and identical to Györkös et al. (2012). All items performed as predicted and presented relevant factor loadings on the expected factors in both samples, except item 16 that loaded less than 0.40 and was arranged in HC. Factorability measures are described at the bottom of the table.

Data revealed that, although loading patterns presented slight differences from the original studies, the factor structure and interpretations remained similar for each sample, keeping the same structure. Based on EFA results, we conducted CFA, modification indices, and measurement invariance with the second half sample.

Different arrangements were tested with the following rationale: model A represents Triandis and Gelfand's original proposition (1998). Model B is a modified version of model A, where item 16 was re-specified as an indicator of HC rather

Table 2 Item loading of the exploratory factor analysis in Brazil and the USA samples (alphas and omegas in parenthesis)

Item	Factor loadings
Horizontal individualism	(.70; .70)
1. I'd rather depend on myself than others (Eu prefiro depender mais de mim do que dos outros)	.59
2. I rely on myself most of the time; I rarely rely on others (Eu dependo de mim mesmo a maior parte do tempo, eu raramente dependo dos outros)	.72
3. I often do "my own thing" (Costumo fazer as coisas do meu jeito)	.61
4. My personal identity, independent of others, is very important to me (Gosto de ser único/a e diferente dos demais)	.50
Vertical individualism	(.78; .77)
5. It is important that I do my job better than others (Acho importante fazer um trabalho melhor que os demais)	.80
6. Winning is everything (Vencer é tudo)	.71
7. Competition is the law of nature (Competir é a lei da natureza)	.58
8. When another person does better than I do, I get tense and aroused (Quando outra pessoa se sai melhor do que eu, fico tenso/a e agitado/a)	.61
Horizontal collectivism	(.77; .76)
9. If a coworker gets a prize, I would feel proud (Se um colega de trabalho ganha um reconhecimento, me sinto orgulhoso/a)	.71
10. The well-being of my coworkers is important to me (O bem estar dos meus colegas de trabalho é importante para mim)	.81
11. To me, pleasure is spending time with others (Para mim, prazer é passar o tempo com os outros)	.52
12. I feel good when I cooperate with others (Sinto-me bem quando coopero com os outros)	.58
16. It is important to me that I respect the decisions made by my groups (Acho importante respeitar as decisões tomadas pelo meu grupo)*	.46
Vertical collectivism	(.80; .79)
13. Parents and children must stay together as much as possible (Pais e filhos devem passar o maior tempo possível juntos)	.64
14. It is my duty to take care of my family, even when I have to sacrifice what I want (É meu dever cuidar de minha família, ainda que tenha que sacrificar meus desejos pessoais)	.84
15. Family members should stick together, no matter what sacrifices are required (Os membros da família devem permanecer juntos, não importando o sacrifício que isso possa exigir)	.74
KMO	.74
Bartlett	1032.50 ($p < .01$)
Eigenvalue (variance explained HC)	3.36 (17.99%)
Eigenvalue (variance explained VI)	2.91 (12,16%)
Eigenvalue (variance explained VC)	2.06 (10,08%)
Eigenvalue (variance explained HI)	1.35 (5.45%)

Original scale: HI (items 1, 2, 3, 4), VI (items 5, 6, 7, 8), HC (items 9, 10, 11, 12), and VC (items 13, 14, 15, 16). The items are listed followed by their Portuguese version in parenthesis. Brazilian participants ($N=99$), North American participants ($N=101$)

HI, horizontal Individualism; HC, horizontal collectivism; VC, vertical collectivism; VI, vertical individualism

*Originally in VC

Table 3 Test of different models of the instrument

Model	χ^2 *	χ^2/df	GFI	CFI	TLI	NFI	RMSEA [95%CI]
A original	184.77	1.89	.90	.90	.88	.81	.07 [.05–.08]
B (re-specify item 16 to HC)	157.87	1.61	.91	.93	.92	.84	.05 [.04–.07]
C (re-specify item 13 and 16 to HC)	179.60	1.83	.90	.91	.88	.82	.07 [.05–.08]

ANOVA between models was conducted, and chi-square difference indicated a better fit for model B
HC, horizontal collectivism

* all $p < .01$, $df=98$; Brazilian participants ($N=101$); State American participants ($N=99$)

Table 4 Invariance between Brazil and the USA samples

Model	χ^2 * (diff)	DF (diff)	CFI (delta)	RMSEA (delta)	AIC	BIC
B (16 to HC)						
Configural invariance	241.69	196	.95	.05	10,500	10,856
Configural loading-metric invariance	(26.12)	(12)	(.016)	(.005)	10,502	10,819
Configural intercept-scalar invariance	(66.35)	(12)	(.062)	(.018)	10,545	10,822
Configural means	(28.01)	(4)	(.028)	(.007)	10,565	10,829

HC, horizontal collectivism

* all $p < .01$

than VC, such as found in the EFA and in modification indices ($mi=28.25$). Model C is a modified version of model B where item 16 was re-specified as an indicator of HC and also based on EFA, and item 13 was tested in HC based on the modification indices found ($mi=15.29$). There were no more model suggestions based on modification indices above 10 (Albright, 2008; Rosseel, 2014). The different models of CFAs tested are shown in Table 3. Model B showed the best fit to the data.

Model B shows the best fit for the sample. The next step was testing the equivalence across samples. Table 4 shows the results.

There is a slight difference in invariance tests (Hirschfeld & Von Brachel, 2014). We found that the model structure is invariant across groups (configural invariance) (CFI is >0.95 , and RMSEA is <0.05 , and the relation between AIC/BIC is low) (Lugtig & Hox, 2012). Configural invariance indicates that participants from different groups conceptualize the constructs in the same way. The metric invariance, that test if different groups respond in the same way to the items, is also satisfied (Milfont & Fischer, 2010). The models show a decrease in the value of CFI lower or equal to 0.01 in almost all indexes (most often cutoff of delta CFI <0.01 , Hirschfeld & von Brachel, 2014). It was acceptable (showing values about 0.01), but as expected, the scalar invariance and the item intercept were not similar across the groups (both >0.01). Scalar invariance indicates that “individuals who have the same score on the latent construct would obtain the same score on the observed variable regardless of their group membership” (Milfont & Fischer, 2010, p. 115). The

scalar invariance that allows the comparison between latent scores is expected to be different because we measure values in different contexts, and the averages are expected to be different. Configural means, or the error variance invariance test, compares if the same level of measurement error is present for each item between groups and is acceptable as RMSEA change was less than 0.015 (Tomás et al., 2014). In summary, the results show the expected and desirable configural and metric invariance for a cultural measure.

Discussion

This study shows that the factorial structure of the HVIC scale found in our samples resembled the factor solutions identified in previous research and interpretation. Yet, some limitations were found in the invariance limits (Hirschfeld & von Brachel, 2014). All HVIC factors emerged in the combined sample and the items loaded in expected factors. The only exception was item 16 which loaded in the original VC factor and loaded in HC in the present study in both samples similarly to Li and Aksoy (2007) in a sample of Turkish students. Györkös et al., (2012) also found that item 16 loaded in both factors (VC and HC) when working with Swiss and South African worker samples (Table 1).

The metric invariance was acceptable (showing values about 0.01), but the scalar invariance and the item intercept were not similar across the groups (both greater than 0.01). In this study, we were unable to demonstrate full metric invariance for this scale. Although the cutoff of scalar invariance would be <0.01 , Györkös et al., (2012) showed the same hindrance in its results, and though this index is important for group comparison, it is expected that cultural groups will show different scores in a value measure (Rhee et al., 1996; Singelis et al., 1995). Rhee et al. (1996) reported that the structure of the latent variables fluctuated across the groups tested. Singelis et al., (1995, p. 242) noted that the “factors that are extracted from a factor analysis may not emerge as clearly in other cultures” suggesting that in the case of culture, a bandwidth could be preferred (Singelis et al., 1995).

Study 2

The second study aimed to test if the results found in Study 1 could be replicated in the different states of Brazil. We also aimed to compare value priorities within the country.

Method

Participants

The sample was composed of 5,589 frontline employees such as ticket sellers and coach and bus drivers of a single transport company distributed in five Brazilian states: Rio de Janeiro ($N=2,367$), São Paulo ($N=2,004$), Minas Gerais ($N=303$),

Santa Catarina ($N=495$), and Paraná ($N=420$). Thirty-two percent of the respondents had up to elementary education, 62.67% up to high school, and 5.23% had some undergraduate experience. The average age was 41.08 ($SD=12.24$) years old, and 84.05% were male. Regarding their positions, 16.7% work as bureaucratic-administrative, 8.1% as support in the garage and 8.3% as mechanics, 14.6% selling tickets, 9.2% as managers, 38.5% as drivers, and 4.6% in traffic assignments.

Instruments

The questionnaire consisted of the HVIC 16-item scale as in study 1 and occupational variables. The occupational variables covered company, department, state, business segment in the holding, seniority in the organization, and work position.

Analysis

We performed a multigroup CFA to test the structural equivalence between the different states estimated by maximum likelihood. In addition, we performed a one-way ANOVA to compare the HVIC scores found among Brazilian states. Finally, to analyze which is the predominant values in each state, we performed paired sample tests.

Results

The baseline model for the multigroup CFA was the model B used in study 1 ($X^2/d.f. = 22.88$, $GFI=0.95$, $CFI=0.93$, $NFI=0.92$, $NNFI=0.91$, $RMSEA=0.06$). The following table (Table 5) reports the factor loadings, standard in the CFA for model B. The factor loadings presented are similar to the results, in the CFA, except horizontal collectivism, where the loadings were higher.

Following Milfont and Fischer's proposal (2010), measurement invariance across the states was tested (Table 6).

The results indicate that the factor loadings can be assumed as equal, since the chi-square is not significant, and the CFI delta is smaller than 0.01 (Hirschfeld & Von Brachel, 2014). They also show measurement invariance, that is, the measure is

Table 5 Triandis and Gelfand's HVIC Scale with CFA standard factor loading (SFL) (alfas and omegas in parenthesis)

Horizontal individualism (.78; .78)			Vertical individualism (.73; .73)			Horizontal collectivism (.77; .81)			Vertical collectivism (.76; .76)		
Item	SFL	Error	Item	SFL	Error	Item	SFL	Error	Item	SFL	Error
1	.59	.009	5	.64	.009	9	.75	.006	13	.72	.007
2	.77	.007	6	.64	.009	10	.71	.007	14	.76	.006
3	.72	.008	7	.69	.009	11	.46	.010	15	.68	.007
4	.66	.008	8	.57	.010	12	.77	.005			
						16	.66	.007			

Table 6 Structural equivalence (invariance measures) in different states of Brazil

	χ^2 (diff)	DF (diff)	CFI (delta)	RMSEA (delta)
Model B (16 to HC)				
Configural invariance	2704.0	490	.92	.06
Configural loading-metric invariance	(123.82)	(48)	(.003)	(.002)
Configural intercept	(210.94)	(48)	(.006)	(.001)
Configural means	(63.00)	(16)	(.002)	(.000)

HC, horizontal collectivism

interpreted as similar within the country. Once the measurement invariance is established, it is possible to conduct mean differences between states.

Table 7 shows the means and the difference between the states. We compared each dimension between states, and in VC, there were no differences between them; moreover, VC is the most endorsed by all states with differences within them.

The results show that Minas Gerais has lower HI than all other states ($p < 0.01$), and there is no difference between the others. São Paulo has higher VI than Rio de Janeiro and Minas Gerais ($p < 0.05$ and $p < 0.01$, respectively). Minas Gerais has higher HC than Paraná, Santa Catarina, and São Paulo ($p < 0.05$; $p < 0.01$; $p < 0.01$, respectively). Furthermore, there were no differences in VC between them.

Table 8 shows the means and the difference between the different dimensions in each state.

In all state samples, Brazil endorsed significantly higher VC scores, followed by HC, HI, and VI. That is, the lower scores are in VI in all the states. However, exceptions occur in Minas Gerais and Paraná between HI and VI in which the difference was not significant.

Discussion

Our results showed a stable factorial structure within the southeast and southern regions of Brazil. Thus, this allows to support evidence that it is an appropriate scale to analyze values at part of the intracountry level. In general, the psychometrical properties of the scale were good, suggesting that the factor structure was stable,

Table 7 Comparison between the states: mean (S.D.)

State	HI	VI	HC	VC
Minas Gerais ¹	4.35 (2.39) ^{2,3, 4,5}	4.45 (2.24) ⁵	8.08 (1.07) ^{2,4,5}	8.27 (1.20)
Paraná ²	5.01 (2.02) ¹	4.88 (2.18)	7.83 (1.18) ¹	8.17 (1.31)
Rio de Janeiro ³	5.16 (2.22) ¹	4.71 (2.25) ⁵	7.91 (1.25)	8.14 (1.32)
Santa Catarina ⁴	5.30 (2.03) ¹	4.81 (2.01)	7.78 (1.25) ¹	8.15 (1.33)
São Paulo ⁵	5.13 (2.13) ¹	4.91 (2.13) ^{1,3}	7.84 (1.27) ¹	8.13 (1.38)

Superscript numbers indicate the average differences between each state. HI, horizontal individualism; VI, vertical individualism; HC, horizontal collectivism; VC, vertical collectivism

Table 8 Comparison within the states: mean (S.D.)

State	HI	VI	HC	VC
Minas Gerais	4.35 (2.39) ^{HI-VI n.s.}	4.45 (2.24) ^{HI-VI n.s.}	8.08 (1.07)	8.27 (1.20)
Paraná	5.01 (2.02) ^{HI-VI n.s.}	4.88 (2.18) ^{HI-VI n.s.}	7.83 (1.18)	8.17 (1.31)
Rio de Janeiro	5.16 (2.22)	4.71 (2.25)	7.91 (1.25)	8.14 (1.32)
Santa Catarina	5.30 (2.03)	4.81 (2.01)	7.78 (1.25)	8.15 (1.33)
São Paulo	5.13 (2.13)	4.91 (2.13)	7.84 (1.27)	8.13 (1.38)

HI, horizontal individualism; *VI*, vertical individualism; *HC*, horizontal collectivism; *VC*, vertical collectivism. All the paired sample *t* tests are significant ($p < 0.001$) with exceptions in HI-VI for Minas Gerais and Paraná (n.s.)

that the structure was the same as found elsewhere (Györkös et al., 2012; Li & Aksoy, 2007; Torres & Pérez-Nebra, 2015; Triandis & Gelfand, 1998), and that item 16, “It is important to me that I respect the decisions made by my groups” although proposed as VC it is, in this sample, interpreted as HC. It also shows accuracy and reliability to identify differences in values between participants from Minas Gerais, who displayed higher scores in HC and lower scores in individualism scales than the other states. Results from the meta-analysis conducted in Brazil found similar results (Torres et al., 2015).

Minas Gerais, a state as big as Spain, has an interesting history that can help explain its difference from the other states. It was originally populated by indigenous groups, which were exterminated (similarly to what occurred in other states). The gold mining induced a migration of Europeans (mainly from the north of Portugal) and increased the influx of slaves during the eighteenth century (IBGE, 2021b). This period was followed by large coffee plantations, and it had tardy industrialization compared to the other states. Until now, Minas Gerais has had a high local GDP based mainly on agriculture and mineral extraction activities (3rd highest in the country), being the second most populated state in Brazil (IBGE, 2021a; IBGE, 2021c). This context was usually related to a preference for conformity, hierarchy, and values related to vertical collectivism (e.g. Torres et al., 2015).

The states’ history can also contribute to explain differences found among them (Table 8). Minas Gerais has one of the highest levels of Portuguese ancestry (Kehdy et al., 2015), and São Paulo was composed equally of Portuguese and Italian migrants, followed by Asians, mostly Japanese. São Paulo peculiarly has more people of Asian descent than African (Schlesinger, 2010). Considering Italy is more individualist than Portugal, and Japan shows high levels of individualism, this combination can elucidate some of the results (Hofstede et al., 2010). Other states such as Paraná, Santa Catarina, and Rio de Janeiro are not landlocked as Minas Gerais which explains their higher intense mixture and the recent European migration waves over last two centuries in those states.

Several studies described Brazil as an HC country (Torelli & Shavitt, 2010, study 3; Torres & Pérez-Nebra, 2015, study 1), although that might result from biased sampling. As those studies apply mostly white-collar samples with highly educated people and often just a few professional categories such as public servants, they are

far from a fair representation of the country's population (Bal et al., 2019; Pérez-Nebra et al., 2021). The present study achieved a more authentic sample closer to the national census description. Muthukrishna et al., (2020) also found high power distance in Brazilian samples following Schwartz (1992) explanation that places power at the core of such phenomenon in Brazil (Fernandes & Ferreira, 2009; Magalhães, 2013; Tamayo et al., 2001), emphasizing the vertical dimension. Therefore, the absence of vertical dimension was dismantled when the sampling bias was reduced (Nelson & Shavitt, 2002).

General Discussion

The research aim was to test the invariance of the Triandis and Gelfand (1998) HVIC scale structure and test its capacity to identify differences between and within the country. The first study replicated the original source while comparing the USA and Brazilian students, finding similar patterns in both samples. Then, the second study verified the stability in a broad sample showing measure invariance and listing differences among southeast and southern states within Brazil.

The results supported the four-factor measurement model proposed by Triandis and Gelfand (1998), which showed a good fit and, in general, the items loaded within the expected factors. The invariance test from study 1 exhibited equivalent structure between the USA and Brazil, although some item interpretation differences may be identified as those which should be expected in this kind of study. The invariance test revealed that the factorial structure in study 2 was invariant inside the country but showing different endorsements. This is interesting because research based on country borders is often oblivious to the regional differences within the country itself (Smith et al., 2013), and we could unveil how diverse Brazil is among the states measured (in a practical view), in which the only exception was the most endorsed VC.

Hence, one could describe Brazil as a VC country, which might make more sense than HC for any Brazilian. It also has some implications in terms of cultural value priorities as the population tend to adjust themselves to significant social relationships and power distance. Human values play an essential role in life as they influence people's personality and behaviors, so it has clear effects on psychological functioning (Markus et al., 1996; Rohan, 2000). Values refer to what is considered socially desirable or preferable by social actors and influence their actions. Therefore, on a collective level, the cultural value profile of one country or state has implications that should be addressed when discussing policy and legislation.

The research also shows that the scale has room for improvement; however, in psychometrical terms, the VC measure items can be reviewed to better comprise the phenomenon and ensure the quality of construct measurement and assess the variety of behaviors associated with VC. Some items related to unequal power situations were intended to reflect agreement with power stances. Adding items that consider groups from different hierarchical levels and their variable privileges could be a way to minimize ambiguity. That way, refined items could benefit the measure, helping respondents better discriminate between alternatives.

Practical Implications

This research could contribute to help practitioners and policymakers in designing more accurate policies and practices that fit the values and needs of the population. The higher VC scores found implies that Brazilian psychological functioning is not only group-oriented, as has been generally assumed, but also power-sensitive. According to Markus et al., (1996, p. 857), “it co-occurs with self-deprecation, self-criticism, and shaming.” Thus, a collective (state or nation) cultural profile helps understanding interpersonal, intragroup, and intergroup behavior.

Torres and Pérez-Nebra (2015) made an emic adaptation of the construct in Brazil, but their measure results in a long scale (56 items), and comparing their and our results respectively were $HI=0.70, 0.78$; $VI=0.68, 0.73$; $HC=0.84, 0.81$; $VC=0.63, 0.76$. This means that the present scale was more parsimonious but also showed better reliability, and, as such, the scale can successfully be used in Brazil and its results compared to other countries and samples.

Study Limitations

Despite its theoretical and practical contributions, the present article holds limitations. The first limitation emerges from the considerable challenge of gathering an accurate sample of Brazilian participants. Covering the entire country with the same organization and function is extremely difficult. Albeit the desired coverage was not ideal, it is worth mentioning the six states studied comprise 47% of the 211 million current population, which means almost half of the Brazilian population was contemplated in the study, but all the north and northeast that is culturally rich and different were not covered. In contrast, the organization that supplied data collection is national, so the human resource practices adopted have no foreign interference nor cultural confusion. Thus, an important avenue of research would be the inclusion of the five Brazilian regions.

Another limitation relates to the VC content. Despite the original VC factor aggregating items related to family and group, the item that covers groups did not load. Thus, the VC factor became composed only of items family-related which suggests risk for bias. Lastly, we note the well-known and documented limitations described in self-reporting studies. The main goal of this work was to test the stability of the HVIC structure in Brazil. The results show a stable four-pattern structure that may be used in a cross-cultural comparison study. Future studies should include different assessments of the vertical-horizontal dimension and apply other paradigms, such as differential item functioning (dif models).

As Hofstede, Hofstede, and Minkov (2010) pointed out, studying differences in culture among groups premise cultural relativism. With this study, we have contributed to cross-cultural research supplying a comparable scale. In this sense, the study showed that the scale is applicable in Brazil and found similar structure

abroad (Györkös et al., 2013; Li & Aksoy, 2007). It was not our goal to deepen the debate about the horizontal-vertical dimension in this cultural domain. However, we pointed out some differences that could expand and contribute to the understanding of the phenomenon. Finally, we support Fischer et al. (2011) advising cross-cultural studies to consider Brazil's diversity instead of assuming a single homogenous sample. Cultural differences do not fit within borders. They require historical, anthropological, and socioeconomic considerations to sort their cultural units.

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Data availability The datasets generated and analyzed during the current study are not publicly available due the fact that they constitute an excerpt of research in progress but are available from the corresponding author on reasonable request.

Declarations

Consent to Participate Informed consent was obtained from all individual participants included in the study (research ethical approval by CAAE number 54945416.6.0000.0023).

Conflict of Interest The authors declare no competing interests.

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