

Factor invariance of the Humor Styles Questionnaire and its relationship with the HEXACO personality model in a Spanish community sample

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Abstract

The cross-cultural factor invariance of the Humor Styles Questionnaire (HSQ) structure, and its relationships with the HEXACO personality model were analyzed in a large Spanish community sample. The effect of age, gender, and social position on the observed relationships was also investigated. The four-factor structure of the HSQ was largely invariant compared to the original one. Males and younger participants score higher on all four domains of the HSQ, but no relevant effect of social position is observed. The HEXACO-60 dimensions and facets predicted between 17% and 32% of the HSQ domains. Results and discussion broadly support that the HEXACO personality model can be used as an adequate personality framework for the research and understanding of humor styles.

Keywords: Humor Style Questionnaire, HEXACO, social position, cross-cultural stability.

1. Introduction

Martin's model of humor styles (Martin et al., 2003), and the corresponding instrument Humor Style Questionnaire (HSQ), represents the most widely used research tool for assessing humor

(Ruch & Heintz, 2016). The HSQ has been translated into many languages, providing opportunities to investigate humor styles across countries and obtaining generalizable conclusions about the structure of humor styles and their relationships with other psychological variables.

Humor styles (Martin et al., 2003) describe the individual's use of humor in everyday life. Martin's model is based on two underlying dimensions: 1) The use of humor directed to self vs humor addressed to others, and 2) the use of benign vs detrimental humor. The combination of these two dimensions provides four humor styles: Affiliative, Self-enhancing, Aggressive and Self-defeating. The affiliative humor style concerns the use of positive humor directed at others to establish relationship, foster group spirit, and reduce tensions. It includes telling jokes, gently teasing others, practical jokes and entertaining others. The Self-enhancing humor style concerns the use of positive humor directed at oneself, and refers to the ability to find humor in unpleasant life situations rather than being overwhelmed by negative emotions, enabling certain distance from stressful situations. The aggressive humor style concerns the use of detrimental humor aimed at harming others, and includes insulting, sarcasm, irony, ridicule, and the use of humor as a manipulation strategy. The self-defeating humor style concerns the use of negative humor directed at oneself, and includes jokes at one's own expense, the purpose of which is to gain approval from others and to reduce stress.

Initial examination on the Canadian sample showed a robust four-factor structure of the HSQ, good internal consistency for all four scales, and good convergent validity (Martin et al., 2003). The HSQ has since been translated and validated in many languages. Findings across countries showing a four-factor structure, good internal consistency for affiliative, self-enhancing and self-defeating scales, but lower for the aggressive scale, and a similar pattern of correlations among scales across many countries: Belgium (Saroglou, 2002), Japan (Takaoka & Tanaka-Matsumi, 2017), Turkey (Bilge & Saltuk, 2007), Egypt (Kalliny et al., 2006), Serbia (Branković et al., 2023), India (Majumdar & Kumar, 2017), Lebanon (Kazarian & Martin, 2004). Quite similar findings were observed in most of the 28 countries examined by Schermer et al. (2023), who concluded that there are many more similarities than differences among humor styles across different countries. However, the factor invariance of the HSQ comparing to the original version was only tested in a few countries. Moreover, although the Spanish version of the HSQ has been used in humor research (Salavera et al., 2020), and the four-factor structure seems to be replicated in Spanish population (Leñero-Cirujano et al., 2022; Torres-Marín, et al., 2018), none of these studies have tested the factorial invariance of the instrument comparing with the original study (Martin et al., 2003).

Humor styles scales have also showed a stable relationship with many psychological variables. Affiliative and self-enhancing humor styles were found to be positively correlated with happiness (Yue et al. 2014), satisfaction with life, well-being (Dyck & Holtzman, 2013; Jiang et al., 2020) and psychological resilience (Kennison, 2022; Veselka et al., 2010), and negatively with loneliness (Schermer et al., 2017), depression and social anxiety (Martin & Ford, 2018; Tucker et al., 2013). Elsewhere, Aggressive and self-defeating humor styles were found to be correlated negatively with happiness (Ford et al., 2016; Lu et al., 2023) and positively with loneliness (Schermer et al. 2017). Beyond psychological correlates, in a pioneer study in this area, Wu, et al., (2018) revealed that efficiency of white matter regional communication predicts high self-enhancing humor and low aggressive humor, and different activity in brain areas has also been related to humor styles (Chan, et al., 2018).

Although scholars generally agree that the HSQ is a valuable instrument, several studies have also revealed some weakness. For example, low convergence validity of the HSQ scales (Heintz & Ruch, 2015), low criterion validity for self-defeating and aggressive humor scales (Heintz, 2017) and a dual nature of self-defeating humor style (Heintz and Ruch, 2018) have

been suggested. In agreement with such findings, Silvia & Rodriguez, (2020) concluded that Martin's model of humor styles or its corresponding instrument may require some adjustments. In general, it can be concluded that the HSQ is a valuable research tool, but more research about its internal structure and validity is needed.

Regarding validity, the relationship between humor styles and personality traits has been examined deeply, especially with the Five Factor Model (FFM). An overview of findings obtained so far (Mendiburo-Seguel, et al., 2015; Plessen et al., 2020) showed consistent multiple correlations between humor styles and the FFM. Thus, Extraversion correlated positively with Affiliative and Self-enhancing humor style, while Neuroticism correlated positively with Aggressive and Self-defeating, and negatively with Self-enhancing humor style. Agreeableness and Conscientiousness negatively correlated with the two detrimental humor styles, whereas Openness to experience correlated positively with the two benign humor styles. Authors concluded that adaptive humor styles are associated with greater flexibility, coping skills, imagination and capacity for insight, while negative humor styles are related to low capacity for control of impulses and reflexes.

Regarding other personality models, similar findings were also obtained in studies which examined the relationships of humor styles with Zuckerman's alternative personality model (Čekrljija et al., 2022). Sensation Seeking was identified as the main personality trait, correlating in significantly with all humor styles. Extraversion, Neuroticisms and Aggressiveness showed correlations consistent to those obtained by FFM factors. Interestingly, the authors speculated that Sensation Seeking and Extraversion might be related to the frequency of humor, while Neuroticisms and Aggressiveness might determine if the humor expressed is benevolent or detrimental (Čekrljija et al., 2022).

In regard to the HEXACO personality model (Ashton & Lee, 2007), results also showed a negative correlation between Honesty-Humility and both detrimental humor styles (Veselka et al., 2010a; Vrabel, et al., 2017). Like the FFM, both benign humor styles are mainly associated with Extroversion, and Openness (Veselka et al., 2010a; Vrabel, et al., 2017). In addition, Agreeableness from the HEXACO model correlates with Aggression but not with Self-defeating (Vrabel, et al., 2017; Veselka et al., 2010a), and Conscientiousness presents negative, albeit low, correlations with both detrimental humor styles. Emotionality presents correlations with Self-Enhancing (negative) and self-defeating (positive) in one study (Veselka et al., 2010a), but only with Aggressive in the other (Vrabel, et al., (2017). These correlations are mainly due to genetic factors (Veselka et al., 2010a). It should be underline that both the Veselka et al., (2010a) and Vrabel, et al., (2017) studies were conducted in English-speaking countries.

More recently, and in another cultural context, Torres-Marín et al., (2018) analyzed the relationships among humor styles and psychological well-being, FFM and HEXACO in Spanish samples. Relationships with the first two were as expected but, in the case of HEXACO, the authors only reported significant correlations between Extroversion and Affiliative, Agreeableness and Self-enhancing, Emotionality and Aggressive humor style, Conscientiousness and Self-defeating, and Openness and Affiliative. On the other hand, the other correlations in the English-speaking samples mentioned above, such as Extroversion and Self-enhancing humor style, were not replicated in the Spanish population. This lack of replication could be because Torres-Marín et al., (2018) computed correlations between Humor styles and HEXACO traits in a sample of 105 undergraduate students. This somewhat limited and small sample size calls for a replication of the relationships between HEXACO and Humor styles in the Spanish context, using a more representative sample.

Concerning gender differences in humor, studies have consistently shown higher scores in males on all four humor style scales (Martin, et al., 2003; Schermer et al., 2023). Some authors

(Greengross & Miller, 2011) have suggested that humor represents a useful tool for finding a partner, as it is a marker of intelligence, so a possible explanation from an evolutionary standpoint of why males have developed it more than females is that they typically compete to get a female partner, while females choose their mate among multiple competitors.

Several studies (Martin et al., 2003; Tsai et al., 2023) also show that younger subjects score significantly higher on humor styles directed at others (affiliative and aggressive), and significantly lower on self-enhancing humor style. Schermer et al. (2023) remarked that this pattern of correlations between age and humor style can be recognized across countries.

Social position (SP) represents one's economic and sociological position, based on a person's education and occupation. Social position has been found to be associated with personality traits from the Alternative Five-Factor Model (AFFM; Zuckerman et al., 1993) and HEXACO (Ashton & Lee, 2007) personality models, as well as with dark triad personality traits across cultures (Aluja et al., 2022). Socioeconomic status has also been identified as a significant determinant of psychological variables related to humor styles, such as well-being (Navarro-Carrillo et al., 2020), life satisfaction (Moreno-Agostino et al., 2021) and quality of life (Niedzwiedz et al., 2012).

Tümekaya (2011) reported significant (although with a weak effect size) associations for socioeconomic status with humor styles, being positive with affiliative and self-enhancing, and negative with self-defeating humor. Amani and Shabahang (2018) reported a positive association between income level and affiliative humor, as well as negative associations between education level and aggressive and self-defeating humor styles, while Majumdar and Kumar (2017) found significant differences in humor styles between different occupations. They reported that, for instance, nurses showed high preference for affiliative humor style, and low for aggressive. On the contrary, police officers tend to use aggressive humor. It should be noted that most studies have analyzed humor styles in specific occupations such as salespersons (Amani & Shabahang, 2018), teachers (Torok, McMorris & Lin, 2004) or doctors (Wojtyna & Stawiarska, 2009), which provide partial conclusions only. Therefore, more detailed studies focused on the comparison of humor styles across different educational levels and different occupations are required to establish replicable relationships between socioeconomic status and humor styles.

In the context of the present study, it should be stressed that HEXACO personality traits also show gender and age differences. Thus, it is well established that women score higher on Emotionally and Honesty-Humility (Ashton, & Lee, 2007; García et al., 2022; Moshagen, et al., 2019), and Honesty-Humility is also the trait that presents the largest effect of age, with older people scoring higher (Ashton and Lee, 2016; Moshagen, et al., 2019). In regard to Social Position, much less research has been conducted compared to gender and age variables. Recently, García et al., (2022) reported that better social position was associated with higher scores on Honesty-Humility, Extraversion, Conscientiousness and Openness, and lower scores on Emotionality. Considering that gender, age and social position are all associated with differences in humor styles and HEXACO traits, it seems advisable to control for these variables in the observed relationships between both kinds of constructs.

The HSQ was originally developed at the University of Western Ontario (Canada) with a total sample of 1195 participants with a mean age of 25 years. (Martin et al., 2003). Despite the robust evidence favoring a four-factor structure, studies showed low interest in comparing the original structure with the adaptation of the HSQ in other countries. Note that the present study has been carried out 20 years later, in a different sociocultural and linguistic context and with a wider community sample with a higher mean age. Furthermore, much of the convergent and divergent validity studies between Humor Styles and personality have been conducted with the FFM framework, and little research has been dedicated to the analysis of relationships between

humor styles and other personality models. In the case of HEXACO, as far as we know, only three studies have been carried out with this aim in mind: Two of them in the English language (Veselka et al., 2010a; Vrabel, et al., 2017), and only one in a non-English-speaking sample (Torres-Marín, et al., 2018). The last one did not replicate some of the relationships observed in the English language, but analyses were conducted on a quite limited and small sample. Thus, a replication with a more appropriate sample is necessary. Taking all this into account, the present study was designed with two aims: a) to test the invariance of the factorial structure of the HSQ in a Spanish population comparing to the original one, and b) to explore the relationships of the HSQ with HEXACO traits using a large Spanish community sample. In accordance with the previous findings from studies using other personality models, namely the FFM, HEXACO and AFFM, we expected a strong correlation between Affiliative humor and Extraversion and Openness to Experience. Self-Enhancing humor should present high correlations with Extraversion, Openness to experience, and Agreeableness. Aggressive humor should correlate negatively with Honesty-Humility, Agreeableness and Conscientiousness, and Self-Defeating humor should also be negatively associated with Honesty-Humility. In addition, since differences in humor styles and HEXACO personality traits are affected by gender, age and, to a lesser extent, social position, controlling for these three sociodemographic variables would seem necessary if we are to detect the real relationships between both constructs. Therefore, this study will also set out to shed light on the effect of gender, age and social position on differences in Humor styles.

2. Material and methods

2.1. Participants

The participants were 727 volunteers from the Spanish general population. There were 354 men ($M_{\text{age}} = 55.05$; $SD = 14.10$) and 372 women ($M_{\text{age}} = 55.03$; $SD = 14.09$). There were no age differences between the two gender groups ($t\text{-test} = .36$; $p < .927$). The participants had an age range between 25 and 94 years (Figure 1). Participants reported their educational and professional level to obtain the Social Position Index (SPI; Hollingshead, 1957; Hollingshead & Redlich, 1958). Both Occupation (1 - higher executives to 7 - unskilled employees) and Education (1 - graduate professionals to 7 - less than seven years of school) are scored on a 7-point scale. The formula for obtaining the SPI score was the following [$SPI = (\text{Occupation score} * 7) + (\text{Education score} * 4)$]. The range of scores considered were upper: < 17 ; upper-middle: 17-31; middle: 32-47; low-middle: 48-63; and low: > 63 (Hollingshead & Redlich, 1958). Note that lower scores represent higher Social Position.

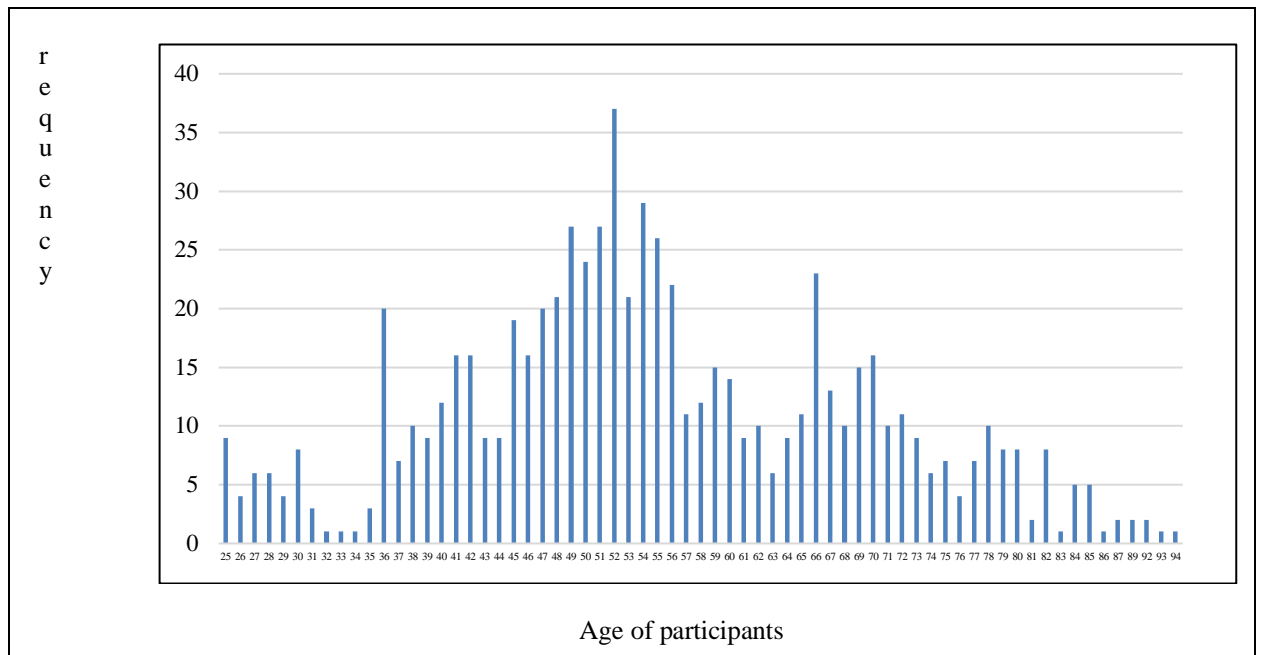


Figure 1: Distribution frequencies of 727 participants between 25 and 94 years old.

2.2. Measures

2.2.1. Humor Style Questionnaire (HSQ)

The Humor Styles Questionnaire (HSQ; Martin et al., 2003) contains 32 items distributed into four scales that correspond to four humor styles (AFI: Affiliative Humor, ENL: Self-Enhancing Humor, AGR: Aggressive Humor, DEF: Self-Defeating Humor). Participants answer on a 7-point Likert scale ranging from 1 (*completely disagree*) to 7 (*completely agree*). In the original study, the humor styles scales showed an alpha reliability of .80, .81, .77 and .80 respectively (Martin et al., 2003). The HSQ was translated into Spanish and blindly back translated into English by a professional translator. The modifications were translated into Spanish and reviewed until agreement was reached between the translation and back translation.

2.2.2. HEXACO-60

The HEXACO-60 is an abbreviated 60-item version of the HEXACO-PI-R (Ashton & Lee, 2009). The HEXACO-60 contains 10 items for each of the six domains, and their corresponding facets, respectively: HH – Honesty/Humility (Sincerity, Fairness, Greed-Avoidance and Modesty); EM – Emotionality (Fearfulness, Anxiety, Dependence and Sentimentality); EX - Extraversion (Social Self-Esteem, Social Boldness, Sociability and Liveliness); AG - Agreeableness (Forgiveness, Gentleness, Flexibility and Patience), CO - Conscientiousness (Organization, Diligence, Perfectionism, Prudence), and OE - Openness to Experience (Aesthetic Appreciation, Inquisitiveness, Creativity, Unconventionality). The Inventory covers a wide range of content, with at least two items representing each of the four facets of each scale in the larger HEXACO-PI-R (Ashton & Lee, 2008; Lee & Ashton, 2004, 2006).

The original internal consistency reliabilities ranged from .77 to .80 in the college sample, and from .73 to .80 in the community sample for domains (Ashton & Lee, 2009). For this study, the Spanish translation of the HEXACO-60 by Romero et al (2015) was used.

2.3. Procedure

Participants were recruited with the help of undergraduate students on a personality psychology internship for teaching and research. The participants signed an informed consent, authorizing anonymous use of the data. The students also signed a data release document for the research. The study had the authorization of the ethics committee of the university within the framework of a national research project. A protocol was drawn up with the paper questionnaires, and each student administered the protocols to four men and four women between the ages of 25 and 94 years old. Younger subjects were not considered (< 25 years old) to avoid an overrepresentation of university students. The study was conducted in accordance with the Helsinki declaration on ethical principles of biomedical research.

2.4. Data analysis

Several statistical analyzes were performed. First, a frequency distribution visual graph by age is presented, descriptive of all the variables including values of kurtosis, skewness, and internal consistency of the scales. An exploratory analysis of the HSQ was performed and different goodness-of-fit indices were examined. To test the adequacy of a four-factor structure, a Hot-Deck Multiple Imputation in Exploratory Factor Analysis was performed (Lorenzo-Seva & Van Ginkel, 2016). We used a robust bias-corrected and accelerated analysis (BCa; Lambert, Wildt & Durand, 1991) with 500 estimated bootstrap samples with asymptotic covariance/variance matrix with 95% of bootstrap confidence intervals. The extraction method was the Robust Unweighted Least Squares (RULS) with normalized Varimax and correction for robust Chi square and LOSEFER empirical correction (Lorenzo-Seva & Ferrando, 2022). The RULS is mostly superior to other extraction methods when the data are ordinal (Moshagen, & Musch, 2014), and allows us to compute goodness of fit indexes to test the four-factor structure. Later, to test the similarity between the rotated original factor loadings and those reported in the present study, a Procrustes rotation matrix (Ten Berge, 1977) and congruence coefficients were computed (Cliff, 1966; Lorenzo-Seva, & Ten Berge, 2006). For this analysis, the factor procedure conducted was the same as in the original study (Martin et al., 2003, pp. 58-59): Principal Component with Varimax rotation (PCA).

The relationships between the four domains of the HSQ with the HEXACO dimensions and facets were also explored by means of partial correlations controlling for the effect of age, gender, and SPI. Finally, the predictive value of gender, age, SPI, and the domains and facets of the HEXACO-60 on each of the four domains of the HSQ was explored using a multiple regression analysis (stepwise method). Enter PIN (probability of F to enter) were fixed to $p < .001$ to control the Type I Error rate, and to identify only the most salient predictors. This correction is especially relevant in the regression analysis using HEXACO facets given the increment of independent variables and, thus, the higher likelihood of Type I error. Statistical analyses have been carried out using the SPSS 26.0 (IBM Corp., 2019) and Factor.exe (Ferrando & Lorenzo-Seva, 2017).

3. Results

3.1. Descriptive, distribution frequency values and internal consistence

Table 1 shows the statistical descriptives, skewness, kurtosis, and Cronbach's Alpha internal consistency for every variable. The mean age is 55.03 years ($SD = 14.09$), and the mean of the

SPI is 34.13 ($SD = 18.44$), which is situated in the “Upper-Middle” range. Since the standard deviation of the SPI is large, and the distribution is normal (skewness and kurtosis values are close to zero), the sample could be considered a good representation of the whole social position continuum.

Affiliative Humor (40.37 vs 46.4: $d = -.75^1$) was lower than that obtained in the original study by Martin et al (2003). The Self-Enhancing Humor mean (35.35 vs 37.3; $d = -.24$) is similar to the original. Both Aggressive Humor (22.06 vs 28.5; $d = -.77$) Self-Defeating Humor (20.66 vs 25.9; $d = -.60$) averages were also lower. Hence, in accordance with results obtained in the original study by Martin et al. (2003), scores on both positive humor styles scales were higher than on negative ones, although in the present study scores were lower on Affiliative, Aggressive and Self-Defeating Humor scales. Compared to results obtained with a Spanish sample (Schermer et al., 2023), average scores on humor styles scales were the same for Aggressive and Self-enhancing, and lower for Self-defeating and Affiliative humor style scale.

The HSQ domains obtained a range of Cronbach alpha between .65 (Aggressive humor) and .83 (Affiliative humor), similar to the range of .77 - .80 reported by Martin et al (2003). The HEXACO alpha values were between .72 and .75 for domains, and between .42 and .70 for Facets. It should be reminded that this low facet reliability has also been observed in previous studies with the HEXACO-60 given the low number of items in every facet (García et al., 2022).

Table 1. Statistical descriptives, Skewness, Kurtosis and Cronbach alpha of the variables considered in the present study

	Min	Max	Mean	SD	S	K	Alpha
Age of subject	25	94	55.03	14.09	.20	-.32	--
SPI	11	77	34.15	18.44	.51	-.57	--
Affiliative Humor	12	56	40.37	9.42	-.49	-.28	.83
Self-Enhancing Humor	12	56	35.35	7.79	-.26	.09	.70
Aggressive Humor	8	50	22.06	7.50	.50	.05	.65
Self-Defeating Humor	8	43	20.66	7.76	.46	-.33	.72
<i>Sincerity</i>	3	15	11.53	2.63	-.45	-.52	.59
<i>Fairness</i>	3	15	10.98	3.13	-.46	-.71	.70
<i>Greed-Avoidance</i>	2	10	6.30	1.95	-.06	-.50	.59
<i>Modesty</i>	2	10	8.31	1.56	-.99	.86	.48
<i>Honesty-Humility</i>	15	50	37.12	6.58	-.35	-.14	.75
<i>Fearfulness</i>	3	15	9.71	2.72	-.13	-.42	.62
<i>Anxiety</i>	2	10	7.24	1.82	-.56	.08	.50
<i>Dependence</i>	2	10	6.13	1.90	-.09	-.47	.55
<i>Sentimentality</i>	3	15	10.95	2.44	-.41	-.09	.61
<i>Emotionality</i>	14	50	34.04	6.36	-.04	-.05	.76
<i>Social Self-Esteem</i>	4	15	11.89	1.94	-.72	.78	.45
<i>Social Boldness</i>	3	15	8.60	2.62	-.04	-.25	.67
<i>Sociability</i>	2	10	6.39	1.81	-.23	-.35	.50
<i>Liveliness</i>	2	10	6.86	1.78	-.27	-.30	.64
<i>Extraversion</i>	16	50	33.74	5.70	-.22	.19	.74
<i>Forgiveness</i>	2	10	6.23	1/.99	-.15	-.55	.67
<i>Gentleness</i>	3	15	9.60	2.16	-.05	-.07	.36

¹Cohen's d : 0.10: very small, 0.20: small, 0.50: medium, 0.80: large, 1.20: very large.

<i>Flexibility</i>	3	15	9.54	2.44	-.10	-.32	.52
<i>Patience</i>	2	10	6.78	1.90	-.29	-.52	.54
Agreeableness	11	50	32.16	6.03	-.11	.33	.72
<i>Organization</i>	2	10	7.66	1.79	-.55	-.37	.43
<i>Diligence</i>	3	10	7.78	1.62	-.52	-.32	.33
<i>Perfectionism</i>	3	15	11.18	2.25	-.34	-.07	.45
<i>Prudence</i>	3	15	10.82	2.42	-.44	-.01	.63
Conscientiousness	20	50	37.44	5.71	-.28	-.08	.72
<i>Aesthetic Appreciation</i>	2	10	7.07	2.13	-.48	-.49	.55
<i>Inquisitiveness</i>	2	10	6.98	2.00	-.52	-.21	.48
<i>Creativity</i>	3	15	9.40	2.88	.00	-.63	.61
<i>Unconventionality</i>	3	15	9.09	2.44	-.02	-.25	.42
Openness to Experience	10	49	32.54	6.61	.69	-.44	.72

Note: Min: Minimum; Max: Maximum; SD: Standard Deviation; S: Skewness; K: Kurtosis. SPI. Social Position Index. Facets in italics.

3.2. Sociodemographic variables and Humor Styles

Men scored higher than women in all HSQ domains: Affiliative [$M = 41.83$ vs 38.97 ; ($SD = 8.86$ vs 9.73); $d = .31$], Self-Enhancing [$M = 36.24$ vs 34.49 ; ($SD = 7.38$ vs 7.77) $d = .23$] and Self-Defeating [$M = 21.89$ vs 19.48 ; ($SD = 7.90$ vs 7.45) $d = .32$] with small effect sizes, and Aggressive [$M = 23.88$ vs 29.32 ; ($SD = 7.55$ vs 7.05) $d = -.73$] with a large effect size. Affiliative ($r = -.16$; $p < .001$) and Self-Enhancing humor ($r = -.10$; $p < .009$) were weakly associated with higher social position (SPI).

Focusing on age, younger participants scored higher on all four domains of the HSQ [Affiliative Humor ($r = .32$; $p < .001$), Self-Enhancing Humor ($r = -.09$; $p < .01$), Aggressive Humor ($r = -.12$; $p < .001$) and Self-Defeating Humor ($r = -.10$; $p < .01$)]. Figure 2 shows the estimates means obtained in the four dimensions of the HSQ by age ranges, previously converted into T scores, and controlling the effect of gender and SPI. A general linear model (GLM) was used. The GLM test is based on the linearly independent pairwise comparisons among the estimated marginal means corrected by the co-variables effect. The effect of the SPI for the four domains of the HSQ is null. Gender influences the four HSQ domains ($p < .001$), but only a medium effect is observed for Aggressive Humor ($\eta^2 = .06^2$).

² $\eta^2 < .0099$ = negligible; $\eta^2 > .01$: small; $\eta^2 \geq .0588$ medium; $\eta^2 \geq .1379$: large effect size (Cohen, 1988).

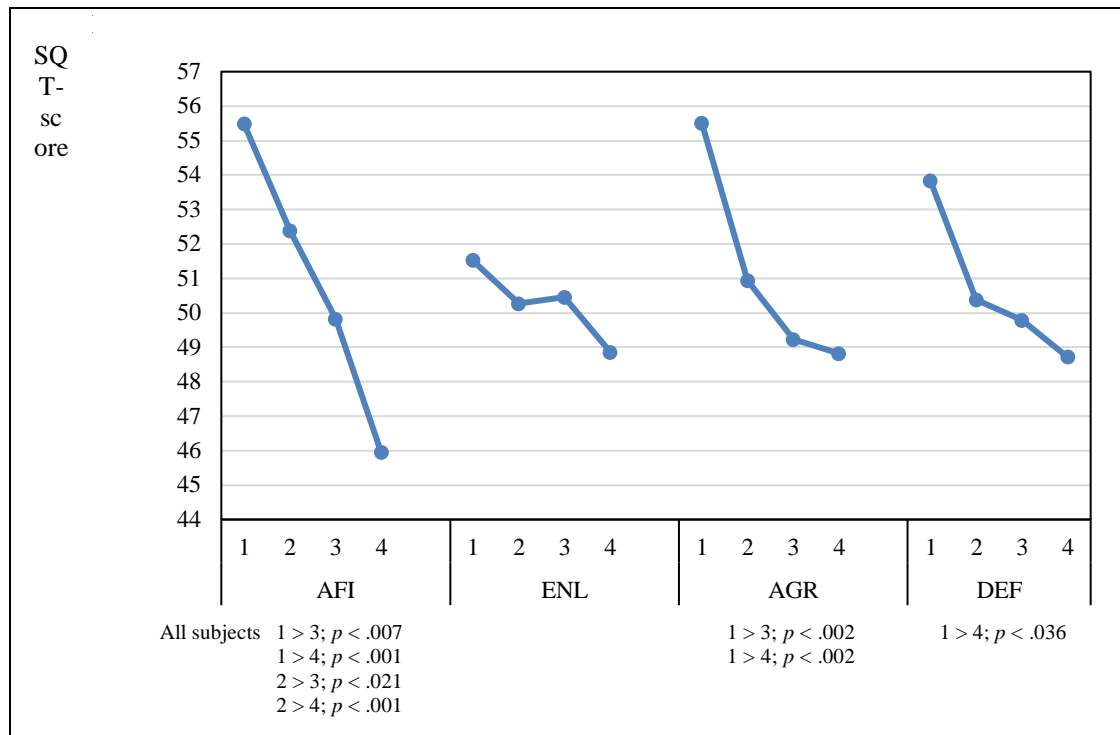


Figure 2. GLM mean estimation comparison excluding gender and SPI effect of age ranges and Humor Styles Questionnaire (HSQ). AFI: Affiliative Humor, ENL: Self-Enhancing Humor, AGR: Aggressive Humor, DEF: Self-Defeating Humor. Age ranges: 1: 18 to 35 years old; 2: 36–50; 3: 51–65; 4: more than 65 years old.

3.3. Factor analysis of the HSQ and factor invariance comparing the original structure with that reported in the first study

Firstly, to test the adequacy of a four-factor structure, a more appropriate factor procedure for ordinal data was used. The extraction method was the Robust Unweighted Least Squares (RULS) with normalized Varimax and correction for robust Chi square and LOSEFER empirical correction (Lorenzo-Seva & Ferrando, 2022). Bartlett's statistic = 5795.3 (df = 496; $p < .000010$). Kaiser-Meyer-Olkin (KMO) test = .85266 (good) and bootstrap 95% confidence interval of KMO = (.824 - .865).

Robust goodness of fit statistics after LOSEFER correction were Root Mean Square Error of Approximation (RMSEA) = .03, Non-Normed Fit Index (NNFI) = .97, Lorenzo-Seva & Ferrando (2022), Comparative Fit Index (CFI) = .98, Adjusted Goodness of Fit Index (AGFI) = .97, Root Mean Square of Residuals (RMSR) = .04. All goodness of fit indexes were appropriate, supporting the four-factor structure. The reliability estimates ORION³ were .92, .88, .86 and .82 for I, II, III and IV factors, respectively (Table 2; F-I. Affiliative humor; F-II. Self-Enhancing humor; F-III. Aggressive Humor; and F-IV. Self-defeating humor).

Table 2 shows the mixed Procrustes orthogonal matrix and the congruence coefficients for each item and factor of the HSQ. Satisfactory congruence coefficients were equal to or above the value of .90. Our Procrustes matrix had an overall congruence coefficient of .95. All factors exceed the value of .90, but four items present low values (22, 30, 11 and 19).

³Acronym for 'Overall Reliability of fully-Informative prior Oblique N-EAP scores'

Table 2. Orthogonal Procrustes rotation and congruence coefficient between the original HSQ (Martin et al., 2003) and current Spanish factorial matrix

Item	F-I	F-II	F-III	F-IV	C.C.
1	.65	.11	.11	-.03	<i>1</i>
5	.65	.30	.00	.11	.98
9	.58	.15	.15	-.02	.95
13	.69	.31	-.02	.05	.96
17	.72	.15	.18	.12	.97
21	.62	.20	-.14	.15	.98
25	.69	.12	.05	.02	.99
29	.62	.12	.17	-.16	.97
2	.23	.53	-.01	-.04	.95
6	.49	.35	-.01	.14	.85
10	-.06	.77	.08	-.01	.98
14	.29	.60	.07	.04	.95
18	-.09	.79	.00	.08	.97
22	.27	.15	.27	-.13	.64
26	.05	.65	-.10	.07	.99
30	.11	.25	-.11	.07	.90
3	.06	-.07	.56	.12	.95
7	-.15	-.13	.49	.10	.94
11	.05	.23	.34	.16	.78
15	.05	-.02	.64	.07	.99
19	.13	.32	.20	.40	.78
23	.21	-.07	.58	.00	<i>1.00</i>
27	.00	.02	.55	.29	.97
31	.10	-.02	.63	-.04	.99
4	.09	-.05	.12	.53	.97
8	.09	-.02	.08	.67	.98

12	.13	.12	.21	.62	.97
16	.18	-.10	.37	.44	.94
20	-.01	-.06	.12	.69	.94
24	-.15	-.10	.04	.57	.98
28	.00	.39	.05	.33	.90
32	.01	-.03	.04	.58	.90
CC	.95	.92	.95	.97	.95

1. *Note:* Loadings >.25 on their corresponding factors are in boldface

3.4. Partial correlational analysis between HEXACO-60 and HSQ

Partial correlation matrix between the HSQ domains and the HEXACO-60 dimensions controlling for age, gender and SPI is shown in Table 3. Honesty-Humility correlated negative with Aggressive (-.38; $p < .001$) and Self-Defeating Humor (-.22; $p < .001$), while Emotionality correlated negatively with Self-Enhancing (-.13; $p < .001$) and Aggressive Humor (-.17; $p < .001$). Extraversion was positively associated with Affiliative (.40; $p < .001$) and Self-Enhancing (.35; $p < .001$), as well as negatively with Self-Defeating Humor (-.14; $p < .001$), whereas Agreeableness was positively related with Self-Enhancing (.23; $p < .001$) and negatively with Aggressive Humor (-.25; $p < .001$) Finally, Openness to Experience is related with Affiliative Humor (.22; $p < .001$) and Self-Enhancing Humor (.21; $p < .001$).

Table 3: Partial correlation matrix among HSQ and HEXACO scales controlling for age, gender, and SPI

	Affiliative Humor	Self-Enhancing Humor	Aggressive Humor	Self-defeating Humor
Sincerity	-.04	.03	-.34***	-.21***
Fairness	-.07	.02	-.27***	-.12**
Greed-Avoidance	-.06	.03	-.22***	-.08*
Modesty	-.01	-.03	-.22***	-.22***
Honesty-Humility	-.07	.02	-.38***	-.22***
Fearfulness	-.06	-.15***	-.07	.06
Anxiety	-.05	-.14***	-.18***	-.01
Dependence	-.05	-.16***	-.05	.05
Sentimentality	.06	.07	-.16***	.04
Emotionality	-.03	-.13***	-.17***	.06
Social Self-Esteem	.28***	.25***	-.15***	-.32***
Social Boldness	.39***	.17***	.13***	.01
Sociability	.33***	.26***	.05	.01
Liveliness	.32***	.34***	-.04	-.14***
Extraversion	.48***	.35***	.01	-.14***
Forgiveness	.01	.20***	-.15	-.02
Gentleness	-.02	.11***	-.19	.01
Flexibility	-.01	.17***	-.21	-.10

Patience	.05	.17***	-.16	-.01
Agreeableness	.01	.23***	-.25	-.04
Organization	.00	-.04	-.17***	-.26***
Diligence	.11**	.05	-.18***	-.21***
Perfectionism	.00	-.03	-.24***	-.20***
Prudence	.03	.00	-.22***	-.21***
Conscientiousness	.04	-.01	-.29***	-.31***
Aesthetic Appreciation	.08*	.13***	-.12***	.01
Inquisitiveness	.09*	.12***	-.06	.03
Creativity	.26***	.21***	.04	.09*
Unconventionality	.14***	.08*	.01	.05
Openness to Experience	.22***	.21***	-.03	.07

Note: Correlations higher than $\pm .30$ are in boldface;

* $p < .05$ for $r \geq .08$; ** $p \leq .01$ for $\geq .10$; *** $p \leq .001$ for $r > .12$.

3.5. HEXACO dimensions and facets as predictors of HSQ domains

A multiple regression analysis with the stepwise method was performed for each HSQ domain with an entry PIN (probability of F to enter) of $p < .001$ to control the Type I Error rate, and identify the most salient predictors only. Age, gender, and SPI were also introduced in the equation. In spite of gender being a dichotomous variable, it was also introduced to test its predictive ability. Table 4 shows the standardized beta coefficients of variables entering the equation (R^2 were between .32 and .17). Extroversion is the best personality correlate with the Affiliative humor. In the other three, the best predictors were Conscientiousness, and Honesty-Humility. Note that four different personality dimensions entered the equation for three of the four humor scales. Considering the orthogonal nature of the HEXACO dimensions (Ashton & Lee, 2007; Thielmann, et al., 2022), this pattern of results suggest that humor styles are related with the presence of several HEXACO dimensions for different reasons.

Later, the same analysis was repeated replacing the dimensions by the facets as independent variables (Table 5). Affiliative Humor was predicted by the four Extraversion facets, especially for Social Bal, and one of Creativity (Openness). Age was also included in the equation in negative (adjusted $R^2 = .32$). Self-Enhancing Humor was predicted positively by Liveliness (EX), Sociability (EX), Flexibility (AG) and Creativity (OE) and Fearfulness in negative (EM) (adjusted $R^2 = .20$). Aggressive Humor was predicted by eight facets in negative [Sincerity (HH), Anxiety (EM), Prudence (CO), Gentleness (AG), Fairness (HH), Sentimentality (EM), Social self-esteem (EX) and Perfectionism (CO)], and Social Boldness (EX), in positive (adjusted $R^2 = .28$). Lastly, Self-Defeating Humor was predicted by Social self-esteem (EX), Organization (CO), Modesty (HH) in negative, and Creativity (OE), in positive. It should be emphasized that the percentage of variance accounted for by the four humor styles after the facets was similar to the results reported for dimensions.

Table 4. Results of the multiple regression analysis (PIN < .001) predicting the four humor styles: Independent variables: Age, gender, SPI and HEXACO dimensions.

Affiliative Humor Adjusted R ² = .32				Self-Enhancing Humor Adjusted R ² = .17			
Standardized Coefficients				Standardized Coefficients			
Beta				Beta			
t				t			
p				p			
(Constant)		10.003	.001	(Constant)		17.078	.001
Extraversion	.418	12.934	.001	Conscientiousness	-.269	-7.517	.001
Age	-.256	-8.086	.001	Honesty-Humility	-.206	-5.801	.001
Gender	-.140	-4.490	.001	Openness to Experience	.164	4.506	.001
Openness	.109	3.321	.001	Extraversion	-.135	-3.700	.001

Aggressive Humor Adjusted R ² = .30				Self-Defeating Humor Adjusted R ² = .17			
Standardized Coefficients				Standardized Coefficients			
Beta				Beta			
t				t			
p				p			
(Constant)		25.681	.002	(Constant)		17.078	.001
Honesty-Humility	-.304	-9.129	.001	Conscientiousness	-.269	-7.517	.001
Emotionality	-.179	-5.072	.001	Honesty-Humility	-.206	-5.801	.001
Conscientiousness	-.226	-7.027	.001	Openness to Experience	.164	4.506	.001
Agreeableness	-.171	-5.231	.001	Extraversion	-.135	-3.700	.001

Table 5. Results of the multiple regression analysis (PIN < .001) predicting the four humor styles; Independent variables: Age, Gender, SPI and HEXACO facets

Affiliative Humor Adjusted R ² = .32				Self-Enhancing Humor Adjusted R ² = .20			
Standardized Coefficients				Standardized Coefficients			
Beta				Beta			
t				t			
p				p			
(Constant)		9.666	.001	(Constant)		9.972	.001
Social Boldness	.229	6.267	.001	Liveliness	.230	6.165	.001
Age of subject	-.259	-8.052	.001	Sociability	.170	4.786	.001
Liveliness	.118	3.167	.001	Fearfulness	-.137	-3.920	.001
Creativity	.130	3.916	.001	Flexibility	.141	4.146	.001
Sociability	.126	3.580	.001	Creativity	.125	3.544	.001
Social Self-Esteem	.117	3.307	.001				

Aggressive Humor Adjusted R ² = .28				Self-Defeating Humor Adjusted R ² = .21			
Standardized Coefficients				Standardized Coefficients			
Beta				Beta			
t				t			
p				p			
(Constant)		21.461	.001	(Constant)		19.831	.001
Sincerity	-.188	-5.266	.001	Social Self-Esteem	-.272	-7.759	.001
Anxiety	-.155	-4.426	.001	Organization	-.195	-5.644	.001
Prudence	-.110	-3.122	.001	Modesty	-.138	-3.903	.001
Gentleness	-.122	-3.693	.001	Sincerity	-.133	-3.772	.001
Fairness	-.130	-3.614	.001	Creativity	.117	3.422	.001
Sentimentality	-.120	-3.503	.001				
Social Self-Esteem	-.143	-4.117	.001				
Social Boldness	.136	3.941	.001				
Perfectionism	-.126	-3.486	.001				

4. Discussion and conclusion

The present study aimed to increase the validity of the HSQ in a Spanish population, testing its factorial invariance compared to the original version and analyzing in a more appropriate non-

English sample the convergent and divergent validity of the humor styles with the HEXACO personality model. The roles of gender, age and social position in these correlations were also explored.

With regard to gender differences, males scored significantly higher on all four humor styles, especially on Aggressive, supporting the evolutionary based hypothesis (Greengross & Miller, 2011), which states that males generally use humor more frequently. The observed gender differences are also in a line with Martin's original data (Martin et al., 2003) and consistent to previous results with Spanish samples (Schermer et al., 2023; Salavera et al., 2020; Leñero-Cirujano et al., 2022). The results also showed that younger participants score higher on all humor styles scales. Regarding the Affiliative and Aggressive scales, these results support Martin's hypothesis (Martin et al., 2003) that younger individuals use more humor to enhance relationship with others. Simultaneously, the difference in the Self-enhancing scale is opposite to Martin's assumption that these humor styles represent a healthy coping skill which improves with age. Regarding the educational and occupational level, the results revealed that only higher social position might be associated with higher Affiliative and Self-Enhancing humor, suggesting an impact of higher socio-economic status on producing more benign, positive and supportive humor, rather than detrimental, harmful and maladaptive humor.

Satisfactory internal consistency of the scales was very similar to that reported by Martin et al. (2003), as well as results obtained in Spanish samples (Schermer, 2023, Leñero-Cirujano et al., 2022), indicating cross-cultural reliability across different countries and samples. Exploratory factor analysis yielded similar results to those of the original study (Martin et al., 2003), as well as in studies with Spanish samples (Leñero-Cirujano et al., 2022; Schermer et al., 2023; Torres-Marín, et al., 2018). Four-factor structure of the HSQ, robust goodness of fit statistics, as well as good factors' reliability were provided. Furthermore, comparison of the factor structure with that obtained by Martin et al. (2003) showed satisfactory overall congruency coefficients for factors and items, confirming the cross-cultural factor invariance of the HSQ structure.

However, there are a few exceptions for this cross-cultural invariance. Thus, three items were also identified with lower saturations within corresponding factors (items 22 and 30 from the Self-enhancing scale and item 19 from the Aggressive scale). This is in agreement with previous studies which reported the same items departing from the four-factor structure (Ruch & Heintz, 2016). The basic reason why these items do not fit in the expected four-factor structure is probably related with the content of items. For example, items 19 (*"Sometimes I think of something that is so funny that I can't stop myself from saying it, even if it is not appropriate for the situation."*) and 11 (*"When telling jokes or saying funny things, I am usually not very concerned about how other people are taking it."*) from the Aggressive scale do not directly consider using humor to harm others and lacks a directly aggressive connotation. Item 30 (*"I don't need to be with other people to feel amused, I can usually find things to laugh about even when I'm by myself."*) from the Self-enhancing scale concerns the relationship with others when producing humor, and thus probably overlaps with affiliative humor. This would support results suggesting that the HSQ could present some problems separating Affiliative and Self-enhancing humor scales (Heintz & Ruch, 2015). As for the reverse coded item 22 (*"If I am feeling sad or upset, I usually lose my sense of humor"*), also from the from Self-enhancing scale, it does not directly consider using humor as a coping skill, but emphasizes one's negative basic feelings.

The present article replicates the fact that Extroversion (and Openness to a lesser extent) seems to be the best personality predictor of benign humor styles, especially Affiliative. On the other hand, Honesty-Humility and Conscientiousness are associated with the detrimental types of humor in negative. That is to say, low scores on both factors were associated with high levels

of detrimental humor, especially Aggressive humor. In general, the present results confirm conclusions from previous studies which employed lexical personality models (Plessen et al., 2020), which highlight that positive correlation with Extraversion indicate a strong positive association of humor styles with flexibility and coping skills, while a negative relationship with Conscientiousness, Agreeableness and Honesty-Humility suggests that negative humor styles are associated primarily with lower empathy and capacity for control of impulses. The present results also indicate a cross-cultural replication of relationships between humor styles and HEXACO, which is in agreement with the stability of the factor structure comparing to the original version. Finally, it should be highlighted that the current study failed to confirm an association between Emotionality and Self-Defeating-Style, which was reported in all relevant studies on humor styles and personality factors (Čekrljija et al., 2022; Plessen et al., 2020, Veselka et al., 2010a). Although Emotionality also correlates with Self-Enhancing, the HEXACO dimension did not enter into the equation on the stepwise regression analysis, suggesting that this relationship is somewhat weak and could present replication problems.

The results also suggest that some non-significant relationships observed in the previous study in the Spanish context (Torres-Marín et al., 2018) could be due to the small and limited sample size. What is replicated in the Spanish population is the association between Emotionality and Aggressive humor style. This relationship could be expected from a theoretical point of view, since Emotionality in the HEXACO model is somewhat different from the Neuroticism trait of the FFM. Emotionality includes not only vulnerability to experiencing anxiety, but also feeling empathy and sentimental attachments with others. The fact that the Sentimentality facet defined as the tendency to feel strong emotional bonds with others was associated with Aggressive humor reinforces this interpretation.

A close look at facets allows us to detect interesting patterns, and suggest psychological reasons for the observed differences in humor styles. Facets of Extraversion also presented the greatest predictive power for positive humor styles. The most predictive facets were social boldness for Affiliative humor style, and liveliness for Self-Enhancing. This suggests that Affiliative humor could be mostly linked with one's comfort or confidence within a variety of social situations, whereas Self-enhancing are related more with typical enthusiasm and energy. The fact that Zuckerman's Activity trait was the second trait most related with this humor style (Čekrljija et al., 2022) supports this interpretation. It is important to remark that both positive humor styles were associated with Creativity, indicating that one's preference for innovation and experiment is on the related to these positive humor styles.

On the other hand, both detrimental humor styles, Aggressive and Self-Defeating, were significantly predicted by facets from more personality factors, especially Aggressive Humor. Honesty-Humility, Conscientiousness, and Agreeableness, on the other hand, represent their role by obtaining higher negative associations with detrimental humor styles rather than in determining positive humor styles. In the case of Aggressive humor style, no facets present large standardized beta coefficients (all β coefficient $< .419$), suggesting the psychological complexity of this kind of humor. In the case of Self-Defeating humor, fewer facets are involved and, surprisingly, the most important one is an Extroversion facet (Social Self-Esteem). This facet is defined by a tendency to have positive self-regard, particularly in social contexts. This association is in agreement with the view that people that use a self-defeating humor strategy seek to improve their popularity, avoid unpleasant situations and reduce social stress. It could even be interpreted as a healthy social strategy of self-deprecation (Heintz, & Ruch, 2018).

5. Strengths and limitations of the study

This study has strengths and limitations. One strength is the large community sample characterized by gender parity and a wide age distribution. The fact that the present study relies solely on self-reported measures (with the possible bias of social desirability) could be considered as the main limitation of the study. Future research may want to closely examine the influence of social desirability bias on the four humor style scales. Further validation studies should also involve other humor scales, as well as observational data in the assessment of humor styles, to provide more robust findings. In addition, some relationships observed in previous validity studies have not been replicated. For instance, the absence of any relationship between the Emotionality trait from the HEXACO personality space and Self-Defeating humor might be considered an aspect which requires replication in other countries and cultures.

6. Conclusion

Summing up, the Spanish version of the HSQ shows satisfactory internal consistency and factor structural validity. A more appropriate method of factor extraction clearly supports the four-factor structure. The present paper also confirms the cross-cultural invariance of the HSQ, and therefore supports it as a valuable and practical research tool to assess humor styles in psychological research and in practical settings. It also identifies similar problems with some items reported in previous research, so the present results suggest the need for a slight modification of some items of the HSQ. Furthermore, analysis of the relationships between humor styles and personality traits provided evidence which mostly supports findings from previous studies using other models to describe personality, suggesting that the HEXACO personality model can be used as an adequate personality framework for humor style research. In fact, the unique HEXACO trait of Honesty-Humility plays a relevant role in accounting for the differences on three out of four humor styles.

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