

Measurement Invariance Analysis on the Revised Cheek and Buss Shyness Scale in a U.S. and Japanese College Sample

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ABSTRACT. In the present study, we tested the factor structure of the 20-item Revised Cheek and Buss Shyness Scale (RCBS; Cheek & Melichor, 1985) in a U.S. sample and used measurement invariance analysis to explore its cross-cultural validity in a previously collected Japanese sample (Sato et al., 2018). We additionally measured related personality traits (Big Five; Locus of Control, LOC; and Behavioral Inhibition System/Behavioral Activation System, BIS/BAS) to examine whether each predicted shyness. Participants were undergraduate students in the United States ($N = 525$) and Japan ($N = 508$). Exploratory factor analysis ($n = 261$) revealed a unidimensional structure for shyness to be the best fit. Measurement invariance analysis ($n = 256$ for United States) showed that the RCBS did not establish configural invariance, the weakest level in measurement invariance, suggesting that it may not be a cross-culturally valid and reliable tool to assess shyness. We thus did not perform any cross-cultural comparisons of variables, as initially intended. Results from a hierarchical multiple regression in the U.S. sample found extraversion to negatively predict shyness, $\beta = -.59$, $p < .001$, and neuroticism, $\beta = .18$, $p < .001$, LOC (external), $\beta = .14$, $p < .001$, and BIS, $\beta = .19$, $p < .001$, to positively predict shyness. Gender was not a significant predictor, $\beta = .09$, $p = .075$. Future work may focus on the development of a Japanese shyness measure independent from U.S. conceptualizations to improve the cross-cultural validity and reliability of shyness measures.

Keywords: shyness, factor analysis, measurement invariance, personality, United States–Japan



Open Data and Open Materials badges earned for transparent research practices. Data and materials are available at <https://osf.io/967e5/>.

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概要

本研究は、日本でのシャイネス先行研究 (Sato et al., 2018) における異文化間の妥当性を検討するために、改訂版Cheek and Buss Shyness 尺度 (RCBS; Cheek&Melichor, 1985) の20項目の因子構造について測定不変性分析を使用し、アメリカ人におけるサンプルで検討を行った。さらに、関連する性格特性 (ビッグ・ファイブ尺度、統制の所在; LOC、行動抑制システム/行動賦活化システム; BIS / BAS) を測定し、各尺度がシャイネスを予測できるかどうかを検討した。調査参加者は、アメリカ ($N = 525$) と日本 ($N = 508$) の大学生であった。探索的因子分析 ($n = 261$) を行った結果、RCBSは一次元構造が最適であることが明らかになった。アメリカでのサンプル ($n = 256$) の測定不変性における検定を行ったところ、RCBSは配置不変性が成立しなかったことが示された。これは、因子数が不変であることを示す測定不変性が最も弱い水準であったことから、シャイネスを評価するための異文化間で有効で信頼できるツールではない可能性が示唆された。この結果を考慮し、仮説として予定していた日本とアメリカの異文化間比較は行わなかった。アメリカでのサンプルにおける階層的重回帰分析の結果、シャイネス ($\beta = -.59, p < .001$)、情緒安定性 ($\beta = .18, p < .001$)、統制の所在 (LOC) は外的統制 ($\beta = .14, p < .001$)、そして行動抑制システム (BIS) ($\beta = .19, p < .001$) が予測因子となることが明らかになった。性差は予測因子にならなかった ($\beta = .09, p = .075$)。今後の研究では、シャイネス尺度の異文化間の妥当性と信頼性を向上させるために、日本のシャイネス測定をアメリカのシャイネスを概念化から独立して開発することに焦点を当てる必要がある。

キーワード: シャイネス, 因子分析, 測定不変性分析, 性格, アメリカ/日本

The universality of shyness has been identified in many cultures such as Turkey (Koydemir & Demir, 2008) and the United States (Jones, Cheek, et al., 1986) as a syndrome of social anxiety, behavioral inhibition, and fear of negative evaluation. Shyness consists of affective (e.g., anxiety, increased heart rate, and other physiological reactions), cognitive (e.g., excessive self-consciousness, negative self-appraisal, irrational belief system), and behavioral (e.g., not speaking at social gathering, avoiding large groups, avoiding eye contact) components (Carducci, 2015; Weyer & Carducci, 2001). Some components of shyness are more present in some people than others. Shyness is a construct highly associated with social anxiety, and although some findings supported shyness and social anxiety to be on a continuum (Ran et al., 2018), other evidence describes them as separate constructs (Yang et al., 2013), with shyness manifesting as a personality trait with lower levels of fear, avoidance, and social and functional

impairment compared to social anxiety (Turner et al., 1990).

The pervasiveness of shyness has shown a small but significant increase (42% to 45%) in the past 40 years and may be related to the rise of technology and the decreased opportunity to develop basic interpersonal skills (Carducci & Conkright, 2018). Different types of shyness are associated with varying social and cultural norms (Chen, 2019), and levels of shyness may differ across cultural groups (Afshan et al., 2015). A major study examined the shyness factor structure and its association with key aspects of personality in Japan (Sato et al., 2018). In this study, we extended this work to compare the shyness factor structure between the United States and Japan, as well as its relationship to related personality traits.

Shyness in the United States and Japan

Cultural influences can have direct effects on the manifestations of shyness, and much of the

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cross-cultural research on shyness has focused on comparisons between Eastern and Western countries (Sakuragi, 2004; Stöckli, 2002). Although shyness is a globally pervasive phenomenon, Eastern cultures (e.g., Japan) tend to have higher reported rates of shyness than Western cultures (e.g., United States; Aizawa & Whatley, 2006). Such differences may be due to varying cultural contexts (Sato et al., 2018). Benedict (1946) described the United States as a “culture of sin” that emphasizes internal sanctions. In such cultures, shyness is based on evaluations of individual actions as violations of one’s personal values. On the other hand, she described Japan as a “culture of shame” that relies on external sanctions for good behavior. With regard to shyness, this means that experiences of shyness in Japan are more commonly attributed to evaluated individual actions that violate one’s cultural values or the values of the surrounding people.

This distinction between “culture of sin” in the United States and “culture of shame” in Japan is consistent with the individualism-collectivism concept (Triandis, 1996, 2001). Individualistic cultures such as the United States emphasize independence, autonomy, and individual responsibility, whereas collectivistic cultures strive to maintain interdependence and social harmony in interpersonal contexts. Therefore, shyness in the United States may be manifested more as embarrassment due to violation of personal or internal values (i.e., private self), whereas shyness in Japan is manifested as heightened self-consciousness of how the people around may judge them (i.e., public self; Sato et al., 2018).

Another explanation for differences in the expression of shyness is self-presentation theory (Arkin et al., 1986; Jackson et al., 1997). Self-presentation theory states how concerns about disapproval from others, perceived deficits in interpersonal skills, and reduced self-esteem can be predictive of shyness. Research has shown that culture can play a role in self-presentation theory and shyness in Japanese and American college students (Jackson et al., 2000). In the United States, people tend to value self-expression and thus have more positive descriptions of self (Kanagawa et al., 2001), lower feelings of shame and guilt (Heine et al., 1999), and higher feelings of pride, especially in individual accomplishments (Furukawa et al., 2012). In fact, shyness tends to be less favorable and even discouraged in Western countries (Rubin et al., 2009). In Japan, however, the Japanese tend to be more vulnerable to their

surroundings, with higher fears of rejection from groups (Yamaguchi, 1994) and higher sensitivity to punishment (Yamaguchi et al., 1995). In addition, major differences in communication styles such as being less assertive and responsive (Thompson et al., 1990) and using less emotion in interpersonal conversations in Japan (Frymier et al., 1990) may also be contributors. These opposing relationships between fostering self-expression in the United States and inhibiting self-expression in Japan may account for different manifestations of shyness.

Measuring Shyness and Comparing Its Factor Structure Across Cultures

There have been numerous tools created to assess shyness in the United States. One of the earliest starting points on the assessment of shyness came from the construction of the 44-item Stanford Shyness Survey (Zimbardo, 1977). Later, the development of other scales such as the Interaction Anxiousness Scale (Jones, Briggs, et al., 1986) and the Social Reticence Scale (Leary, 1983) have also contributed to capturing shyness and its related constructs. Finally, a major step forward in improving the construct validity of shyness came with the creation of the original 9-item Cheek and Buss Shyness Scale (Cheek & Buss, 1981) and its subsequent 13-item (Cheek, 1983), 14-item (Cheek & Briggs, 1990), and 20-item Revised Cheek and Buss Shyness Scale (RCBS; Cheek & Melichor, 1985).

Research findings on the most “fit” U.S. shyness factor structure are mixed. When the 9-item Cheek and Buss Shyness Scale and later versions of the RCBS were initially created, it was designed as a unidimensional tool to measure shyness (Cheek, 1983; Cheek & Buss, 1981; Cheek & Melichor, 1985). However, a later study reported a two-factor model to have better fit with the data compared to a unidimensional model (Crozier, 2005), and other studies have reported a clear, three-factor solution in U.S. shyness measures (Hopko et al., 2005; Jones, Briggs, et al., 1986). Hopko et al. (2005) used the 13-item RCBS and reported a three-factor solution labeled Social Distress, Stranger Shyness, and Assertiveness Deficit/Difficulty. The three factors were compatible with other prominent shyness theories, classifications, and related behaviors that illustrate shyness with elements of public and private shyness (Pilkonis, 1977), public and private self-consciousness (Fenigstein et al., 1975), and behavioral inhibition and increased wariness when exposed to novel stimuli or unfamiliar situations (Kagan, 1989).

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There has been increased interest in translating U.S. shyness measures to other languages in order to assess shyness and its factor structure in different cultures. Kwiatkowska et al. (2016) used a Polish adaptation of the 13-item RCBS and found a unidimensional solution, but Vahedi (2011) found a two-factor solution using the 14-item RCBS in a Persian sample. Sato et al. (2018) used a Japanese adaptation of the 20-item RCBS and found a three-factor shyness solution characterized by general anxiety and nervousness (Factor 1), lack of perceived personal competence, capabilities, or skills in social contexts (Factor 2), and a “disability” dimension that may illustrate the significant impairment in functioning shy individuals experience in social situations (Factor 3).

When comparing variables from different cultures, it is important for measurement instruments to maintain equivalence and to capture the same psychological construct. Measurement invariance has been an important technique to assess cross-cultural validity issues in measurement instruments because establishing measurement invariance allows for meaningful and accurate comparisons of psychological constructs across cultures (Milfont & Fischer, 2010). Descriptions of one cultural group may not automatically apply to other cultural contexts, and research conceptualizations developed in the United States may not apply in other countries (Arnett, 2008). Thus, the current study aimed to answer the following question: Can the original shyness conceptualization in the United States, as defined by the RCBS, adequately capture shyness as a construct in Japan?

Shyness and Related Personality Traits: Big Five, Locus of Control, and BIS/BAS

Along with examining the cross-cultural invariance of a measure of shyness, we also wanted to test associations between shyness and key personality variables across cultures. The Big Five is a descriptive model that classifies individual differences in personality into five main factors (Goldberg, 1990). Shyness is most closely related to introversion and neuroticism on the Big Five dimensions in the United States (Briggs, 1988). Numerous cultures have demonstrated the consistency of the five factor personality structure (McCrae & Terracciano, 2005) and have also confirmed introversion and neuroticism to be positively related to shyness (Afshan et al., 2015; Kwiatkowska et al., 2016) including Japan (Sato et al., 2018).

To investigate the causal relationship between a

person's behavior and its associated rewards, Rotter (1966) distinguishes locus of control (LOC) with two types: internal and external. Having higher internal LOC is often associated with more positive life outcomes such as increased sociability (Crozier, 2011), whereas higher external LOC is often linked to negative outcomes such as anxiety (Weems et al., 2003) and poorer interpersonal relationships (Martin et al., 2005). Shyness is more associated with an external LOC orientation in the United States (Henson & Chang, 1998). However, cultural values can also have direct influences on LOC orientation, and previous research has shown lower external LOC in individualistic cultures and higher external LOC in collectivistic cultures (Kang et al., 2015). We thus expected lower external LOC in the United States and higher external LOC in Japan with respect to shyness.

The examination of shyness with dispositional sensitivities is important to understand the neurological origins of shyness and its manifestation in different cultures. Gray's (1981) theory on behavioral inhibition and activation systems (BIS/BAS) postulates two competing motivational systems that regulate inhibited and action-oriented behavior, respectively, in response to environmental cues. Because shyness is related to feelings of anxiety and lack of initiation of a particular behavior, BIS should be more related to shyness, as previous research has shown (Bowker et al., 2019; Ran et al., 2018). Due to the varying cultural contexts as outlined above, we expect higher BIS to relate to Japanese shyness compared to U.S. shyness.

Purpose of Current Study

Sato et al. (2018) reported a three-factor shyness solution in a Japanese sample using a Japanese translation of the 20-item RCBS. Additionally, they reported associations between shyness and key personality traits (i.e., Big Five, LOC, BIS/BAS) to provide evidence for the validity and reliability of the Japanese version of the RCBS through its identical associations to previous U.S. shyness studies. Although the RCBS was developed based on U.S. shyness conceptualizations, Sato et al. (2018) did not statistically compare the Japanese shyness factor structure to a previously-established U.S. shyness factor structure to assess whether the Japanese adaptation of the RCBS is a valid and reliable tool to measure shyness in Japan.

In this study, our goal was to first examine the factor solution of the 20-item RCBS in a contemporary U.S. sample in the light of conflicting results

from past studies and use measurement invariance to see how the shyness factor solution tested on a U.S. sample compares to a Japanese sample collected a few years prior (Part 1). Next, we wanted to test if the relationships between shyness and personality as presented in Sato et al. (2018; Big Five, LOC, and BIS/BAS) held for the U.S. sample, as well as perform a cross-cultural comparison on these key personality measures, contingent upon the establishment of measurement invariance (Part 2). A cross-cultural comparison on the relationship between shyness and related personality traits would shed light on how these variables can be predictive of shyness across cultures.

Method

Participants and Procedure

Participants in the United States were 525 undergraduate students (i.e., 416 women, 101 men, 4 self-identify, 3 transgender people) enrolled in introductory psychology classes at a large, public university in the western United States, recruited between April to December 2020. The study was conducted online and created using Qualtrics, and the university's Institutional Review Board approved the study prior to commencing. Participants selected the study from many options in a participant pool, and informed consent was obtained prior to participation. Students participated in the research in exchange for course credit.

The ages ranged from 18 to 69 years ($M = 22.20$, $SD = 6.47$). Most of the sample was White or European American (65.7%), followed by Asian American (17.3%), Hispanic or Latinx (13.0%), African American (3.8%), Middle Eastern (2.9%), American Indian or Alaska Native (1.5%), or not listed (7.2%). Most identified as straight or heterosexual (83.0%), followed by bisexual (7.6%), gay or lesbian (2.7%), bicurious or questioning (2.7%), queer (1.7%), asexual (0.8%), or different identity (0.6%).

The Japanese sample used in this study was a previously collected sample from the study by Sato et al. (2018). Participants were 508 Japanese undergraduate students (i.e., 278 women, 230 men) from four universities in Japan, recruited between August and December 2015. Students participated in the study as part of a class assignment.

Measures

Shyness

Shyness was measured using the 20-item RCBS (Cheek & Melichor, 1985). The RCBS measures

the affective, cognitive, and behavioral components of shyness (Weyer & Carducci, 2001). Participants rated the extent to which each question was characteristic of one's feelings and behavior on a 5-point scale (1 = *very uncharacteristic or untrue or strongly disagree* to 5 = *very characteristic or true or strongly agree*). The RCBS is a revised version of the original 9-item Cheek and Buss Shyness Scale with strong internal consistency (reliability = .94), correlates highly with the original 9-item version ($r = .96$), and has a 45-day test-retest reliability coefficient of .91 (Melchior & Cheek, 1990). The Cronbach's alpha for the U.S. study was .93. The Japanese adaptation of this measure is a direct Japanese translation of the 20-item RCBS (Sato et al., 2018).

Big Five

The 44-item Big Five Inventory (BFI; John & Srivastava, 1999) measures the Big Five Factors of personality proposed by Goldberg (1990), which are extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. The scale asks participants to rate each statement on a 5-point scale (1 = *disagree strongly* to 5 = *agree strongly*). The BFI is the most well-validated, consistent, and widely used personality measure in the United States that measures these five dimensions. The Cronbach's alphas for this study were .88 (extraversion), .78 (agreeableness), .78 (conscientiousness), .82 (neuroticism), and .76 (openness to experience). The Japanese version of the Big Five (Murakami & Murakami, 1997) measures the same five dimensions and has established evidence for its validity. For the Japanese version, higher scores for neuroticism equated to greater emotional stability; the neuroticism scale was reversed when performing the cross-cultural comparison.

Locus of Control

LOC was measured using the 30-item Japanese LOC Scale (Kamihara et al., 1982) used by Sato et al. (2018), translated into English. The LOC has established evidence for validity and reliability as shown in Kamihara et al. (1982). Participants were asked to indicate whether each question matched with their daily feelings (1 = *yes*, 0.5 = *maybe*, 0 = *no*). Higher scores equated to higher external LOC. The first author, bilingual in English and Japanese, translated the Japanese version into English using back-translation procedures and discussion with another bilingual colleague. We translated the LOC to English to adequately perform the cross-cultural comparison. The Cronbach's alpha for this study was .82.

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BIS/BAS

We measured the Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) using the 20-item BIS/BAS scale (Carver & White, 1995). The scale measures both behavioral inhibition (e.g., anxiety, sensitivity to punishment and novel situations, negative emotions) and behavioral activation (e.g., movement towards goal-directive efforts, positive feelings to rewards). Each participant was asked to rate to what extent the individual either agreed or disagreed with the statement presented on a 4-point scale (1 = *very true for me* to 4 = *very false for me*). The scale was then reverse coded (except for two BIS items) to indicate higher scores as greater sensitivity to BIS or BAS. The scale also measures three BAS-related subscales: Drive, Fun Seeking, and Reward Responsiveness. The Cronbach's alphas for this study were .77 (BIS), .76 (BAS), .71 (BAS Drive), .64 (BAS Reward Responsiveness), and .66 (BAS Fun Seeking). Evidence for convergent and discriminant validity was found by correlating the BIS/BAS with other personality measures (Carver & White, 1995). A direct Japanese translation of this scale was used in Japan, which has also shown evidence for validity and reliability in a Japanese sample (Takahashi et al., 2007).

Data Analysis**Part 1: Examining Whether U.S. and****Japanese Conceptualizations of Shyness Are Similar**

Factor Structure. To test that a unidimensional factor solution in the 20-item RCBS is the best fit as proposed by Cheek and Melichor (1985), we first performed an exploratory factor analysis (EFA) on the 20-item RCBS in a U.S. sample. We selected approximately half ($n = 261$) of the U.S. sample data using a random number generator to conduct the EFA. Because the data distribution was not multivariate normal as assessed by Mardia's test, we conducted principal axis factoring to investigate the factor structure of the RCBS in the U.S. sample. To determine the number of factors to retain, a variety of methods were used as recommended by Henson and Roberts (2006), which included visual examination of scree plot, the K1 method (eigenvalue > 1 ; Kaiser, 1960), parallel analysis, and minimum average partial analysis (O'Connor, 2000).

Measurement Invariance. Measurement invariance was tested using the following three levels: (a) configural invariance, (b) metric invariance, and (c) scalar invariance, progressively testing weaker to stronger invariance to investigate increasingly stringent tests of invariance across cultures (Chen,

2007). Configural invariance is the weakest level of invariance and tests whether the measure demonstrates the same number of factors and configuration of factor coefficients across cultures (Meredith, 1993). If the measure was found to have configural invariance, then the next level of invariance, metric invariance, was tested by constraining factor loadings. Metric invariance demonstrates that factor coefficients are the same and is one way of assessing whether the individual items are interpreted similarly across cultures (Vandenberg & Lance, 2000). Finally, if the measure was found to have metric invariance, the strongest level of invariance, scalar invariance, constrained item-level intercepts, and factor loadings. Scalar invariance demonstrates that the level of the compared latent construct is equivalent across groups (Vandenberg & Lance, 2000).

To determine adequate measurement model fit for configural invariance, we conducted a confirmatory factor analysis (CFA) using SEM in Lavaan, an R package software (Rosseel, 2012). A CFA model was specified and tested (using the remaining half of the U.S. data; $n = 256$) against the hypothesized EFA model to examine data fit. To assess overall model fit, we used the following goodness of fit indices: Chi-square (χ^2 ; Bearden et al., 1982), Comparative Fit Index (CFI; Kline, 2015), Tucker Lewis Index (TLI; Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA; Byrne et al., 1989), and Standardized Root Mean Square Residual (SRMR; Kline, 2015). The following cutoff scores have shown support for reasonably good fit and were used for this study: CFI and TLI $\geq .90$ (Hu & Bentler, 1999), RMSEA $\leq .08$ (Brown & Cudeck, 1993), and SRMR $\leq .10$ (Kline, 2015).

To determine metric and scalar invariance, we compared model fit of each successive model with the immediately prior model using the following criteria to indicate noninvariance: CFI $\geq -.005$, change in RMSEA $\geq .010$, change in SRMR $\geq .025$ for loading invariance, and change in SRMR $\geq .005$ for intercept model (F. F. Chen, 2007).

Part 2: Examining Associations Between Shyness and Key Personality Variables

Hierarchical Multiple Regression. We performed a hierarchical multiple regression to examine whether dimensions of the Big Five, total LOC, and total BIS/BAS scores predict shyness. If the RCBS was found to have scalar invariance from the measurement invariance analysis, we planned

to enter country (United States or Japan) in Step 1. Due to evidence suggesting gender differences in shyness with higher levels of shyness in women than men (Doey et al., 2014), we planned to enter gender in Step 2, and all other variables in Step 3. If we found that the RCBS was not a cross-culturally valid tool, we planned to conduct the regression only for the U.S. sample, entering gender in Step 1 and all other variables in Step 2.

Results

Table 1 shows the means, standard deviations, and confidence intervals for RCBS, Big Five, LOC, and BIS/BAS in the United States and Japan. Table 2 shows correlation coefficients between shyness and related personality traits in both samples.

Part 1

Exploratory Factor Analysis on 20-Item RCBS in the United States

After examining the factor retention criteria in the RCBS as outlined above, the results supported retention of a single factor for shyness, which had an eigenvalue of 9.04. Results are displayed in Table 3. This factor explained 45% of the variance in the items. Examination of the structure/pattern coefficients showed that each of the factor loadings were moderately to strongly associated with the extracted factor.

Measurement Invariance Analysis

To compare the degree of “fit” of the one-factor U.S. shyness model in a Japanese sample, we performed a measurement invariance analysis across the two samples. Using cutoff scores outlined above for goodness of fit indices to meet invariance criteria, we found that the configural model did not provide an adequate fit ($\chi^2 = 970.40$, $p < .001$ /df = 340, CFI = .876, RMSEA = .069, SRMR = .051). Because configural invariance must first be established before examining invariance at more restrictive levels, we concluded that the RCBS is not a cross-culturally valid tool to assess shyness in Japan. Results of the metric and scalar invariance are presented in Table 4.

Part 2

Hierarchical Multiple Regression

Because we found that the RCBS did not satisfy the three levels of invariance, we performed a hierarchical multiple regression to investigate whether dimensions of the Big Five, LOC, and BIS/BAS predicted shyness only in the U.S. sample (see

Table 5). Gender was not a significant predictor of shyness (Step 1). However, in Step 2, we found that extraversion was a significant negative predictor of shyness, whereas neuroticism, LOC (external), and BIS were significant positive predictors of shyness.

TABLE 1

Descriptive Statistics for Major Study Variables

Measure	United States (2020)			Japan (2018)		
	M	SD	95% CI	M	SD	95% CI
Shyness	59.30	15.90	[57.93, 60.67]	62.92	13.30	[61.78, 64.04]
Big Five ^a						
Extraversion	25.23	6.90	[24.63, 25.83]	46.30	9.53	[45.42, 47.19]
Agreeableness	34.36	5.61	[33.88, 34.85]	48.14	10.41	[47.18, 49.11]
Conscientiousness	32.60	5.74	[32.11, 33.10]	50.87	10.35	[49.90, 51.83]
Neuroticism (United States)/ Emotional Stability (Japan)	26.01	6.23	[25.47, 26.55]	47.88	9.75	[46.97, 48.78]
Openness to Experience	34.67	6.07	[34.14, 35.20]	49.29	10.34	[48.33, 50.25]
Locus of Control (external)	11.11	4.57	[10.71, 11.51]	15.76	4.53	[15.37, 16.15]
BIS/BAS						
BIS	22.55	3.61	[22.24, 22.86]	20.91	3.95	[20.57, 21.26]
BAS	40.12	4.76	[39.71, 40.53]	39.50	5.53	[39.01, 39.98]
BAS Drive	10.95	2.12	[10.77, 11.14]	11.55	2.51	[11.33, 11.77]
BAS Reward Responsiveness	17.36	1.95	[17.19, 17.53]	16.24	2.25	[16.05, 16.44]
BAS Fun Seeking	11.80	2.20	[11.61, 11.99]	11.69	2.26	[11.49, 11.89]

Note. $N = 525$ in the United States and $N = 508$ in Japan. CI = confidence interval; BIS = behavioral inhibition system; BAS = behavioral activation system. Sample sizes reflect missing values.

^aWe used the Big Five Inventory (BFI) in the United States, but a culturally adaptive version of the Big Five was used in Japan (Sato et al., 2018). Therefore, the questions and scales used were different across cultures.

TABLE 2

Correlations for Major Study Variables in the United States and Japan

Measure	1	2	3	4	5	6	7	8	9
1. Shyness		-.62***	-.24***	-.27***	.46***	-.45***	.37***	.49***	-.15***
2. Extraversion			.26***	.14**	-.25***	.36***	-.13**	-.20***	.19***
3. Agreeableness				.19***	-.14**	.08	-.20***	-.04	.14*
4. Conscientiousness					-.03	.41***	-.41***	-.06	.12*
5. Neuroticism						-.14**	.27***	.61***	.02
6. Openness to Experience							-.23***	-.24***	.19***
7. Locus of Control (external)								.26***	-.01
8. BIS									-.03
9. BAS									

Note. $N = 525$ for the United States and $N = 508$ for Japan. BIS = behavioral inhibition system, BAS = behavioral activation system. Correlations from the United States are below diagonal and from Japan are above diagonal. The correlation coefficients for the “emotional stability” dimension of the Big Five in Japan were reversed so that higher scores represented greater neuroticism. Correlations reflect missing values.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The purpose of this study was to determine a shyness factor solution using the 20-item RCBS,

TABLE 3

Results From an Exploratory Factor Analysis on the 20-Item Revised Cheek and Buss Shyness Scale (RCBS) in U.S. College Students

No.	Item descriptions	Structure/pattern coefficients	Communality
1	I feel tense when I'm with people I don't know well.	.75	.56
2	During conversations with new acquaintances, I worry about saying something dumb.	.67	.45
3	I am socially somewhat awkward.	.80	.64
4	I do not find it difficult to ask other people for information. (R)	.63	.40
5	I am often uncomfortable at parties and other social gatherings.	.66	.43
6	When in a group of people, I have trouble thinking of the right things to talk about.	.78	.61
7	I feel relaxed even in unfamiliar social situations. (R)	.69	.48
8	It is hard for me to act natural when I am meeting new people.	.75	.56
9	I feel painfully self-conscious when I am around strangers.	.72	.52
10	I am confident about my social skills. (R)	.78	.61
11	I feel nervous when speaking to someone in authority.	.52	.28
12	I have trouble looking someone right in the eye.	.43	.19
13	I am usually a person who initiates conversation. (R)	.61	.37
14	I often have doubts about whether other people like to be with me.	.59	.35
15	Sometimes being introduced to new people makes me feel physically upset (for example, having an upset stomach, pounding heart, sweaty palms, or heat rash).	.67	.44
16	I do not find it hard to talk to strangers. (R)	.78	.60
17	I worry about how well I will get along with new acquaintances.	.62	.38
18	I am shy when meeting someone of the opposite sex.	.54	.29
19	It does not take me long to overcome my shyness in a new situation. (R)	.57	.33
20	I feel inhibited in social situations.	.74	.55

Note. $N = 261$. Reverse scored items are denoted with (R). Factor analysis performed using principal axis factoring.

TABLE 4

Measurement Invariance on the 20-Item Revised Cheek and Buss Shyness Scale (RCBS) in U.S. and Japanese College Students

Invariance Level	$\chi^2(df)$	$\Delta\chi^2(df)$	CFI	ΔCFI	RMSEA	$\Delta RMSEA$	SRMR	$\Delta SRMR$
Configural Invariance	970.40 (340)***	—	.876	—	.069	—	.051	—
Metric Invariance	1104.31 (359)***	133.91 (19)	.853	-.023	.073	.004	.079	.028
Scalar Invariance	1535.55 (378)***	431.24 (19)	.772	-.081	.089	.091	.091	.011

Note. Δ = absolute difference; χ^2 = chi-square; df = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standard root mean square residual.

* $p < .05$. ** $p < .01$. *** $p < .001$.

perform a measurement invariance analysis to investigate whether the RCBS is a cross-culturally valid tool to assess shyness in Japan, and investigate whether related personality traits (Big Five, LOC, BIS/BAS) can predict shyness.

Results from the EFA revealed a unidimensional shyness solution in the United States to be the best fit, which supports previous findings on a unidimensional conceptualization for shyness (Cheek, 1983; Cheek & Buss, 1981; Cheek & Melichor, 1985; Jones, Briggs, et al., 1986). However, other version of the RCBS have shown evidence for a two- or three-factor shyness models as the most common fit, although each proposed factor structure has its limitations (Crozier, 2005; Hopko et al., 2005). Jones, Briggs, et al. (1986) found evidence of a three-factor shyness solution but also noted that “there are persuasive reasons to suspect that a single dimension underlies the construct of shyness” (p. 638). Because a unidimensional solution was found for the 20-item RCBS, this suggests that a shorter version of the RCBS may be adequate to capture the full dimension of shyness. This finding further added to the complexity and lack of consensus among researchers in capturing shyness as a construct.

Measurement invariance analysis revealed that the RCBS did not establish configural invariance, the weakest level in measurement invariance, when comparing between a U.S. and Japanese sample. Although RCBS adaptations in other languages have shown excellent reliability and measurement validity compared to previously-established U.S. factor structures (Kwiatkowska et al., 2016; Vahedi, 2011), we did not find this in our current study. These results have several implications. First, the RCBS may not capture the same construct of shyness in Japan. In addition to evidence for higher rates of self-reported shyness among people of East Asian descent than Western decent (Paulhus et al., 2002), the different cultural contexts may lead to differences in the manifestations of shyness between the United States and Japan as outlined above (Sato et al., 2018). However, the correlations between shyness and key personality traits (i.e., Big Five, LOC, BIS/BAS) appeared consistent in both the United States and Japan, which supports the agreement in the major theoretical framework for shyness across the two cultures. Investigating the subtle, nuanced differences, such as cross-cultural differences in the cognitive component of shyness, will be an area of interest for future research to clarify differences in shyness across cultures.

Another related explanation for this difference in shyness may be that, although shyness is considered a subclinical form of a psychiatric disorder (Turner et al., 1990), shyness in the United States may be seen as a combination of more transient course of symptoms that clearly distinguishes from other types of disorders such as social phobia (Beidel & Turner, 1999). Shyness in Japan, however, may be characterized by more severe symptoms that significantly disrupts social and daily functioning as shown by the proposal of the use of Morita therapy, which uses techniques that are specific to Japan's cultural context, as one method to treat shyness (Ishiyama, 1986, 1987).

To address these shortcomings, future work may focus on the creation of a culturally adaptive Japanese shyness measure that is independent from U.S. conceptualizations to perform adequate cross-cultural comparisons. Additionally, the low adequate fit of the configural model also suggests that there may be an issue in the translation of the Japanese adaptation of the RCBS, and future work may also focus on revisiting the translation of the items, preferably administering the items to bilingual (i.e., English and Japanese) speakers and assessing similarity of the results.

There was no gender difference across total U.S. shyness scores, counter to the initial hypothesis, but other studies have also found similar results (Crozier, 2005; Vahedi, 2011). However, other researchers have found that shyness can have different implications for women and men (Doey et al., 2014; Kerr, 2000), and more investigation is needed to clarify the relationship between shyness and gender.

Shyness was a significant negative predictor of extraversion and a significant positive predictor of neuroticism, LOC (external), and BIS, which further showed how the RCBS is a psychometrically useful tool to assess shyness in the United States. Previous research has shown shyness to have a substantive negative relationship with extraversion and positive relationship with neuroticism in the United States (Briggs, 1988). Shyness encompasses elements of both introversion and neuroticism (Crozier, 1979) but is a separate construct from either as an orthogonal personality dimension (Cheek & Briggs, 1990). High introversion measures withdrawal from social situations, and although introverts may appear identical to shy individuals, introverts lack the intense levels of internal discomfort and difficulties in social interactions that shy people tend to experience

(Schmidt & Fox, 1999). Neuroticism measures a variety of negative emotional states, one of which includes anxiety (Widiger & Oltmanns, 2017). Thus, the combination of both dimensions of the Big Five captures a more complete experience of shy individuals.

In a sample of U.S. undergraduates, Henson and Chang (1998) found that individuals with a more external LOC reported greater shyness than those with an internal LOC orientation, supporting how external LOC positively predicted shyness in our study. In such instances, shy individuals believe that shyness is destiny and controls their lives rather than believing that individuals can control their own shyness (Carducci, 2000). This uncontrollable anxiety and internal discomfort in social situations makes them more prone to believe that outside forces are stronger determinants of life outcomes.

We also found BIS to significantly predict shyness, and previous studies have shown the positive association with shyness (and similar construct, social anxiety) and BIS (Bowker et al., 2017; Levinson et al., 2011) in Western samples. The positive BIS reflects increases in social defense in shy individuals potentially to avoid approaching a particular stimulus in order to avoid punishment

TABLE 5
Hierarchical Multiple Regression for Shyness in U.S. College Students

Variable	B	95% CI for B		SE B	β	R ²	ΔR^2
		LL	UL				
Step 1							.01 .01
Constant	560.42	520.83	600.01	1.83			
Gender	3.60	−0.36	7.56	2.01	.09		
Step 2							.63 .63***
Constant	55.07	41.17	68.97	7.07			
Gender	−0.86	−3.46	1.74	1.32	−.02		
Extraversion	−1.35***	−1.51	−1.20	0.08	−.59***		
Agreeableness	−0.11	−0.29	0.07	0.09	−.04		
Conscientiousness	0.13	−0.06	0.32	0.10	.05		
Neuroticism	0.46***	0.23	0.69	0.12	.18***		
Openness to Experience	−0.06	−0.22	0.10	0.08	−.02		
Locus of Control (external)	0.51***	0.27	0.76	0.12	.14***		
BIS	0.89***	0.49	1.29	0.20	.19***		
BAS	0.08	−0.15	0.30	0.12	.02		

Note. $N = 434$. CI = confidence interval; LL = lower limit; UL = upper limit; BIS = behavioral inhibition system; BAS = behavioral activation system. Gender includes only male and female categories due to small sample sizes of the remaining gender categories. Sample size reflects missing values.

* $p < .05$. ** $p < .01$. *** $p < .001$.

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and unwanted outcomes in social situations. This is illustrated by the approach-avoidant conflict that describes shyness as a syndrome of both social approach and social avoidance motivational tendencies (Asendorpf, 1990). "Forced extraversion," defined as when shy individuals force themselves to be in close proximity with others and/or force themselves to take action that would require social interaction with others, is the most popular self-selected strategy employed by shy individuals to deal with their shyness (Carducci, 2009). For example, shy individuals may go to a party or social event in an attempt to be in close proximity with other people and to engage with the surrounding people. This behavior shows how sociability (the "approach" behavior) is a separate construct often present in shy individuals (Cheek & Buss, 1981). However, oftentimes their doubts in their personal capabilities or lack of social skills leads to the inhibited, withdrawn behaviors, a causal link not tested in the present study.

In addition to the lack of establishment of measurement invariance on the RCBS which voided the cross-cultural comparison, there are several limitations to this study. First, because we intended to perform a cross-cultural comparison using a previously collected Japanese data as presented in Sato et al. (2018), we translated a Japanese version of the LOC (Kamihara et al., 1982) and used this version of the LOC to predict shyness in the United States. This is the first study to date that administered this version of the LOC in a U.S. sample, so we do not have detailed information on the validity and reliability of this measure in a U.S. sample. Second, the U.S. data was collected during remote campus operations due to COVID-19, and due to student challenges associated with pandemic-related environments, the results might have affected the findings of this study, most notably the U.S. shyness factor structure established by the EFA.

The results of this study provided further evidence on the complexity of psychometrically capturing shyness as a construct, with support for a unidimensional shyness solution in our current sample. Our methodology and the use of both U.S. and Japanese samples also highlight significant issues that can arise in this form of work. The pattern of results suggested strong evidence for high validity and reliability of the RCBS in the U.S. sample as shown by its prediction of major related personality traits. However, more research is needed to design instruments that adequately assess shyness across cultures in order to perform

meaningful cross-cultural comparisons for future research. Our work also suggests a closer look at cross-cultural comparisons of other personality constructs is needed as well.

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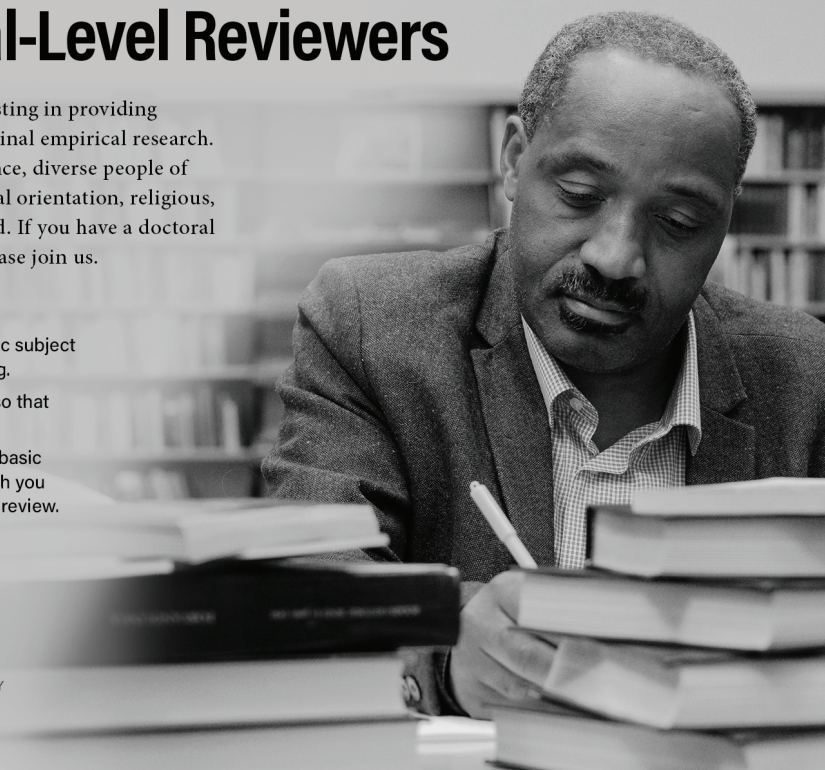
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