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Validation of Korean Version of the Hardiness Resilience Gauge

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Abstract: Hardiness and resilience are known as internal traits that buffer the negative effects of stress and play important roles in individuals' well-being and psychological sustainability. This study aimed to validate the Korean version of the hardiness resilience gauge (HRG Korean). Reliability and validity were analyzed using data obtained from 389 Korean adults. Confirmatory factor analysis with three factors (challenge, control, and commitment) for the HRG Korean showed acceptable model fit, with satisfactory RMSEA and SRMR indices, allowing for some covariance in error terms. Cronbach's α for challenge, control, commitment subscales, and the total HRG Korean were 0.84, 0.74, 0.86, and 0.92, respectively. Analyses of the concurrent validity revealed that the total score of the HRG Korean was closely correlated with the scores of the KHD-SF and MR-KA, which measure hardiness and resilience in Korea, respectively. In addition, the HRG Korean was relatively strongly correlated with life satisfaction and subjective happiness. These findings suggest that the HRG is a valid instrument for measuring Koreans' hardiness and resilience to promote their well-being and sustainability.

Keywords: scale validation; measurement; hardiness; resilience; stress; well-being; sustainability

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1. Introduction

Multiple studies confirm that psychological hardiness and resilience are personal traits that buffer the negative effects of various stressors, maintain individuals' quality of life, and further improve their well-being and sustainability [1–4]. In 1979, Kobasa introduced the concept of hardiness as a personality factor that plays an important role in individuals' psychological resilience, which can help them recover from the negative consequences of stress [5]. It has long been empirically shown that the hardy personality type is resistant to various kinds of stressors [6–8]. For example, hardiness has a psychological health effect that protects individuals from cardiovascular disease, the most common disease caused by stress [9,10]. Thus, hardiness is a psychological variable that many researchers are interested in, not only psychology, but also the nursing and medical fields.

Hardiness was originally conceived as a personality trait or disposition that develops early in one's life and is relatively stable over time and across situations, although it may change under certain conditions [11,12]. Therefore, Bartone refers to hardiness as dispositional resilience [13]. In Korea, there are more studies on resilience than hardiness [14,15]; however, because hardiness is a devotional trait that makes it possible for individuals to recover from severe stress or traumatic experiences, measuring hardiness allows us to predict their resilient abilities more accurately during stressful events. In other words, it is possible to predict whether an individual can resiliently recover from the negative effects of stresses by measuring hardiness.

Earlier, Kobasa conceptualized hardiness as made up of three dimensions, challenge, control, and commitment in life, and measured them with scales of more than 100 items [5]. For practicality, there were attempts to measure hardiness by reducing the number of items on Kobasa's scale; however, there were limitations of these measurement tools, including

the unstable factorial structure [16,17]. Meanwhile, Bartone developed a hardiness scale that was relatively shorter and had a coherent factorial structure of commitment, control, and challenge. It was then refined to the 45-item Dispositional Resilience Scale (DRS) [8,18]. As this scale continued to be revised, a brief hardiness scale (the 15-item Dispositional Resilience Scale, DRS-15) with five items of each subscale was created and widely used. A study validated the DRS-15 for Koreans and showed relatively reasonable reliability and construct validity [19].

However, despite the several advantages of the DRS-15, there are still some limitations. For example, a small number of items is desirable, but this can also be a shortcoming. The subscales of the DRS-15 sometimes show low reliability coefficients [20]. Therefore, Bartone decided to develop a new revision to overcome these limitations and created a 28-item hardiness resilience gauge (HRG) [21]. The existing original items of the DRS-15 were revised so as to be free of culture-specific terms and to be easily understandable, and 21 new items were added. It was validated in a large national U.S. sample of more than 2000 adults. Consequently, it resulted in the final 28 items, with an excellent three-factorial structure and satisfactory reliability coefficients. Finally, Bartone and colleagues established that the HRG is an excellent tool for measuring hardiness [20]. The present study aimed to translate and validate the HRG in Korean, creating a tool that can properly measure the hardiness of Korean people.

2. Methods

2.1. Participants

A total of 389 male and female Korean adults aged 18 years or older were selected using convenience sampling. Data were collected using a questionnaire posted on Google. It was promoted on social networking services (SNSs) and the Internet. Ordinary Korean adults who use the Internet participated in the survey through this promotion, but we attempted to match the ratio of age groups and gender ratios according to age groups. Nevertheless, we did not force this ratio. The survey was completed when all items were answered. Participants were recruited from SNSs where adults participate and from the university student Internet community. One respondent who reported an age of 15 was excluded from the analysis.

The participants' characteristics are presented in Table 1. Among the participants, 190 were men (48.8%), and 199 were women (51.2%). The participants' ages ranged from 18 to 73, with a mean of 42.31 $\pm$ 12.73 years.

Table 1. Characteristics of participants (N = 389).

Variables		Frequency	Percent (%)
Gender	male	190	48.8
	female	199	51.2
Age	20s or below	76	19.5
	30s	72	18.5
	40s	131	33.7
	50s	69	17.7
	60s or above	41	10.5
Religion	none	106	27.2
	Protestant	233	59.9
	Catholic	21	5.4
	Buddhist	21	5.4
	other	8	2.1
Educational attainment	primary school	2	0.5
	middle school	1	0.3
	high school	90	23.1
	college	199	51.2
	graduate school	97	24.9

Seventy-six participants (19.5%) were in their 20s or below, 72 (18.5%) in their 30s, 131 (33.7%) in their 40s, 69 (17.7%) in their 50s, and 41 (10.5%) in their 60s or older. A total of 233 (59.9%) participants were Protestants, 21 (5.4%) were Catholics, 21 (5.4%) were Buddhist, 8 (2.1%) reported that they believed in other religions, and 106 (27.2%) responded that they were not religious. Among the respondents, 199 (51.2%) were college graduates, 97 (24.9%) were graduate school graduates, 90 (23.1%) were high school graduates, one (0.3%) was a middle school graduate, and two (0.5%) were elementary school graduates.

2.2. Measures

The HRG, which was evaluated as the Korean version in this study, was developed by Bartone and published in 2019 by Multi-Health Systems Inc. (MHS) [21]. The HRG consists of 28 items and is divided into three subscales: challenge (10 items), control (8 items), and commitment (10 items). Each item was rated on a four-point Likert scale (0 = not at all true, 1 = slightly true, 2 = quite true, 3 = completely true). In the development and validation of the original scale, the internal consistencies (Cronbach's α) were 0.85, 0.84, 0.89, and 0.93 for challenge, control, commitment, and the total hardiness scale, respectively [20].

Three psychologists participated in translating the HRG into Korean. They all had experience in scale development; two were serving as university faculty and one was retired. First, two psychologists who earned their university degrees in the United States independently translated the HRG from English to Korean. We composed one final translation from two independent translations. The literal, word-for-word translation prevents potential Korean examinees from understanding the content well. Thus, along with two translators, we chose the wording of items to be clearly understood by Koreans. The final translated version was translated back into English (reverse translation). Reverse translation was performed by a bilingual Korean American who was born in the United States, studied at an American international school for 12 years in Korea, received a bachelor's and master's degree in psychology from universities in the United States, and is currently a doctoral student at a university in the United States.

To examine the concurrent and predictive validity aspects of criterion-related validity, we used the Korean version of the Hardiness Scale-Short Form (KHS-SF), Measure of Resilience (MR-KA), Satisfaction with Life Scale (SWLS), and Measure of Subjective Happiness (MSH) [22–25].

The KHS-SF was composed by Lee and Rhee to measure the hardiness of Koreans [22]. This scale consists of 10 items with a single factor, using a five-point Likert scale ranging from 1 (*not at all true*) to 5 (*very true*). In this study, the internal consistency of the 10 items (Cronbach's α) was 0.83.

The MR-KA was developed by Shin et al. to measure the resilience of Koreans, which was validated for Korean adolescents and college students [23]. Although validation was done for adolescents, there were no items that cannot be applied to adults because there was no content related to school life among the items. This scale consists of 27 items, using a five-point Likert scale ranging from 1 (*never*) to 5 (*always*), and divided into three subscales that measure controllability, sociability, and positivity. Only the total score was used for analysis in this study. In this study, the internal consistency of the 27 items (Cronbach's α) was 0.92.

The SWLS, developed by Diener et al., measured participants' life satisfaction [24]. We used the scale translated by Kim [26]. This scale consists of five items, using a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). In this study, the internal consistency (Cronbach's α) was 0.87.

The MSH was developed by Lyubomirsky and Lepper to measure feelings of happiness [25]. In this study, a scale translated by Kim was used [26]. It consists of four items, including one reverse item, which were rated on a seven-point scale when participants were happy like others. In this study, the internal consistency of items (Cronbach's α) was 0.88.

2.3. Procedure

Before gathering the data, this study was approved by the Institutional Review Board of Sahmyook University (IRB approval number: 2-1040781-A-N-012021025HR), and all procedures were conducted ethically. Data were collected with informed consent from the participants. For the online survey, the IRB required documentation, and the elements of written informed consent were presented to participants online. Participants were informed that even those who agreed to respond to the online survey could withdraw at any time while answering the questionnaire items.

2.4. Statistical Analysis

IBM SPSS (Statistical Package for the Social Sciences) Statistics for Windows 23.0 and AMOS (Analysis of Moment Structure) 23.0 were used for statistical analyses. First, the mean, standard deviation, skewness, and kurtosis of the data were checked for parametric statistical analyses using SPSS. Pearson-product moment correlational analysis was performed to examine the criterion-related validity with SPSS, and confirmatory factor analyses were performed using AMOS.

In the confirmatory factor analyses (CFA), the goodness-of-fit was assessed using the Tucker–Lewis index (TLI), comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). In general, an RMSEA and SRMR value of < 0.08 suggests a satisfactory model fit. Additionally, a TLI and CFI larger than 0.90 suggest a good model fit [27]. Additionally, we also calculated the composite reliability (CR) and average variance extracted (AVE) to identify convergent validity. A CR larger than 0.70 and an AVE larger than 0.50 suggest good convergent validity [28].

3. Results

3.1. Confirmatory Factor Analysis and Internal Consistency of HRG Korean

A confirmatory factor analysis was performed with the HRG Korean. We first tested a one-factor model, which showed poor model fit (TLI = 0.794, CFI = 0.810, SRMR = 0.064, and RMSEA = 0.076). Next, we assessed the hypothesized three-factor model. The χ^2 value of this three-factor model was 964.30 (df = 347, $p < 0.001$), and the goodness-of-fit index was TLI = 0.837, CFI = 0.850, SRMR = 0.061, and RMSEA = 0.068 (CI: 0.063 to 0.073). RMSEA and SRMR (below 0.08) were within the range of the indices for good model conditions; however, TLI and CFI (below 0.90) were acceptable but were marginal model fit indices (Table 2).

Table 2. Goodness-of-fit of confirmatory factor analyses for the HRG Korean.

Model	χ^2	*df*	TLI	CFI	SRMR	RMSEA (90% Confidence Interval)
One factor model	1135.44 ***	350	0.794	0.810	0.064	0.076 (0.071–0.081)
Three factor model	964.30 ***	347	0.837	0.850	0.061	0.068 (0.063–0.073)
Three factor with three error covariance	803.14 ***	344	0.878	0.889	0.056	0.059 (0.053–0.064)

*** $p < 0.001$.

Following modification indices (MI), we checked the goodness-of-fit after allowing for three error covariances for items 5 and 6, items 4 and 12, and items 10 and 12. This adjusted three-factor model showed an improved fit. The levels of TLI and CFI came close to 0.90, and SRMR and RMSEA also improved (TLI = 0.878, CFI = 0.889, SRMR = 0.056, and RMSEA = 0.059 (CI: 0.053 to 0.064)).

The standardized regression weights (SRWs) in a confirmatory factor analysis of the HRG Korean allowing for the three error covariances are shown in Figure 1. The SRWs for the challenge subscale ranged from 0.27 to 0.73. In addition, the SRWs for the control subscale ranged from 0.12 to 0.76, whereas the SRWs for the commitment subscale ranged from 0.44 to 0.80. The SRWs of items 3 and 7, which are reverse items, were low. In this model, the estimated correlation between the challenge and commitment subscales was 0.85, and the estimated correlation between challenge and control subscales was 0.92, whereas the estimated correlation between the commitment and control subscales was 0.83.

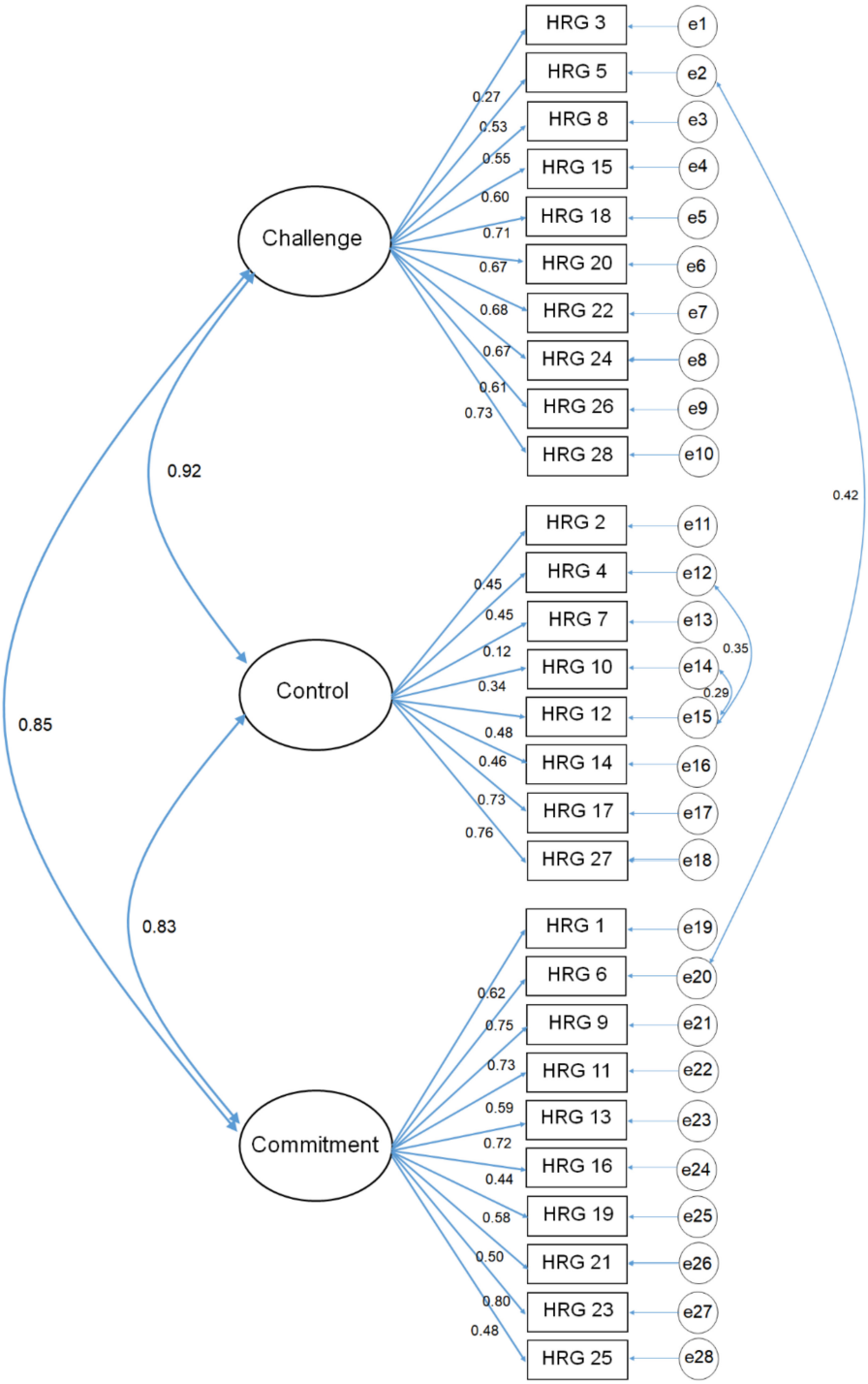

Figure 1. Construct Model of the HRG Korean, Three-Factor Model.

In Table 3, Cronbach's αs that indicate the degree of internal consistency for each 10-item challenge, 8-item control, and 10-item commitment subscales of the HRG Korean were 0.84, 0.74, and 0.86, respectively. Cronbach's α for a total of 28-item HRG Korean was 0.92. Additionally, CRs of all subscales were satisfactory because they were above 0.70 (0.85 for challenge, 0.71 for control, and 0.86 for commitment). However, AVE was low, so all subscales had AVEs less than 0.50, because it became quite low if an item with SRW lower than 0.50 was included.

Table 3. Estimated parameter values, composite reliability, average variance extracted, and Cronbach's α for the HRG Korean three-factor model.

	Item Number	SRW	SE	CR	AVE	Alpha
Challenge	HRG 3®	0.27	-	0.85	0.38	0.84
	HRG 5	0.53	0.37			
	HRG 8	0.55	0.43			
	HRG 15	0.60	0.34			
	HRG 18	0.71	0.40			
	HRG 20	0.67	0.37			
	HRG 22	0.68	0.38			
	HRG 24	0.67	0.38			
	HRG 26	0.61	0.43			
	HRG 28	0.73	0.44			
Control	HRG 2.	0.45	-	0.71	0.27	0.74
	HRG 4	0.45	0.15			
	HRG 7®	0.12	0.15			
	HRG 10	0.34	0.17			
	HRG 12.	0.48	0.15			
	HRG 14	0.46	0.15			
	HRG 17.	0.73	0.21			
	HRG 27.	0.76	0.20			
Commitment	HRG 1	0.62	-	0.86	0.40	0.86
	HRG 6	0.75	0.12			
	HRG 9	0.73	0.12			
	HRG 11®	0.59	0.11			
	HRG 13	0.72	0.12			
	HRG 16	0.44	0.10			
	HRG 19	0.58	0.09			
	HRG 21	0.50	0.08			
	HRG 23	0.80	0.12			
	HRG 25	0.48	0.10			
		Total				0.92

Note: ® reverse item, SRW = standardized regression weight, SE = standard error, CR = composite reliability, AVE = average variance extracted.

Table 4 presents the descriptive statistics and correlational coefficients between subscales of Korean. None of the absolute values for skewness and kurtosis of the HRG Korean subscales exceeded 1.0, suggesting that they were close to a normal distribution.

The correlational analysis revealed that the correlation between challenge and commitment subscales was relatively high ($r = 0.73$, $p < 0.01$). The control subscale was also strongly correlated with the challenge ($r = 0.61$, $p < 0.01$) and commitment subscales ($r = 0.60$, $p < 0.01$). Even so, the confirmatory factor analysis model with one factor showed poor model fit.

Table 4. Descriptive statistics and correlational coefficients between subscales of HRG Korean (N = 389).

Variables	Chanllenge	Control	Commitment	HRG Korean
Chanllenge	1			
Control	0.61 ***	1		
Commitment	0.73 ***	0.60 ***	1	
HRG Korean	0.91 ***	0.81 ***	0.91 ***	1
M	20.19	17.64	20.61	58.44
SD	4.78	3.46	4.93	11.58
Skewness	−0.23	−0.53	−0.26	−0.29
Kurtosis	−0.23	0.94	−0.11	0.20

*** $p < 0.001$.

3.2. Criterion-Related Validity of the HRG Korean

To identify the concurrent and predictive validity of the criterion-related validity, we analyzed how the HRG Korean correlated with the KHS-SF, MR-KA, SWLS, and MSH (Table 5). None of the absolute values for skewness and kurtosis of the KHS-SF, MR-KA, SWLS, and MSH exceeded 1.0, thus satisfying the conditions for conducting parametric statistical analyses.

Table 5. Correlational matrix of KHS-SF, MR-KA, SWLS, MSH, and HRG Korean (N = 389).

Scale	KHS-SF	MR-KA	SWLS	MSH
Challenge	0.72 ***	0.67 ***	0.47 ***	0.49 ***
Control	0.68 ***	0.58 ***	0.41 ***	0.44 ***
Commitment	0.76 ***	0.70 ***	0.64 ***	0.64 ***
HRG Korean	0.82 ***	0.75 ***	0.59 ***	0.61 ***
Skewness	−0.35	−0.44	−0.42	−0.74
Kurtosis	0.21	0.59	−0.22	0.50

*** $p < 0.001$.

The correlational analysis revealed that the total HRG Korean scores were strongly correlated with the KHS-SF (r = 0.82, $p < 0.001$) and MR-KA (r = 0.75, $p < 0.001$), which measure hardiness and resilience in Korea, respectively. These results indicated that the HRG Korean shared more variance with the KHS-SF than with the MR-KA.

In addition, the total score of the HRG Korean was found to be closely related to SWLS (r = 0.59, $p < 0.001$) and MSH (r = 0.61, $p < 0.001$), which measures life satisfaction and subjective happiness. Among the subscales of the HRG Korean, the commitment subscale shared more variance with SLS and MSH than the challenge or control subscales.

4. Discussion

The present study verified the reliability and validity of the hardiness resilience gauge (HRG) as adapted for use in the Korean language and culture, confirming that the HRG Korean is a useful tool for measuring Koreans' hardy personality. The DRS-15 has been validated in several cultures [19,29–32], which also provides an opportunity to confirm whether the HRG can be applied to other cultures. Furthermore, based on the results of this study, we realized that the newly developed HRG compensated for the limitation of the DRS-15 to a certain extent, and some parts were noticeably supplemented. The implications of the findings of this study are discussed below.

In the confirmatory factor analysis, the model fit indices of the factorial structure of the HRG Korean with three factors were not as satisfactory as expected, whereas excellent model fit was shown in the development validation study of the original HRG [20]. Even so, RMSEA, the absolute goodness-of-fit index, of HRG Korean was acceptable. In

addition, when allowing for some error covariance in the confirmatory factor analysis, more acceptable model fit indices were obtained. Because items 4, 10, and 12 belong to the control subscale and are based on the belief that one's life depends on one's own actions, it is presumed that items 4 and 10 share substantial variance with item 12. However, in future studies, it is necessary to confirm that there may be much variance shared between item 5, related to the preference for changes in daily routine in the challenge subscale, and item 6, related to enjoying daily activities in the commitment subscale. There were no items with culturally specific content, as the HRG was developed "to be cross-culturally applicable and free from linguistic bias (p.3)" [20]. However, it still may be that there are some cultural differences in the personality tendencies of individuals in terms of what they pursue. Because the construct validity of HRG Korean cannot be confirmed with a single study, further research is needed with other large samples.

The correlations between the three factors were somewhat higher than those in a KDRS-15 validation study [19]. In addition, the internal consistency of HRG Korean was found to be satisfactory. There was a significant difference between the HRG Korean and KDRS-15 in the internal consistency of the subscales, but the internal consistency of all items of the HRG Korean (α = 0.92) was considerably higher than that of the Korean version of DRS-15 (α = 0.85) [19]. This result was also explained by the fact that the covariate between sub-factors was found to be greater in the HRG Korean than in the Korean version of DRS-15. This finding reiterates that the HRG, which has many new items, provides a more comprehensive and reliable measure of the hardiness construct.

The HRG Korean also demonstrated satisfactory criterion-related validity. The HRG Korean shared 67.2% (r = 0.82) of variance with the KHS-SF, which measures hardiness with a single factor. This result indicated that the HRG Korean would be more useful in measuring individuals' complete hardiness with three factors and relatively few elements. In addition, the HRG Korean was closely related to MR-KA, which measures Koreans' resilience using 27 items. The HRG Korean shared 56.3% (r = 0.75) of the variance with MR-KA. This result suggests that hardiness is a disposition or mindset that can effectively predict an individual's resilience in stressful situations [5], and it is reasonable for Bartone to include the term "resilience" in the DRS and HRG, which measure hardiness [13,20]. Above all, the finding of the HRG's close relationship with the KHS-SF and MR-KA suggests that the HRG is a valid and good measure for assessing Koreans' hardiness.

The HRG Korean was also relatively closely related to satisfaction with life. The HRG Korean shared 34.8% (r = 0.59) of the variance with the SWLS, whereas the original English version of HRG shared 23.0% (r = 0.48) of the variance with the SWLS in the development validation study of the scale [20]. Since previous studies have verified that hardiness has a positive relationship with life satisfaction [33,34], this result indicates that the HRG Korean is a useful tool for predicting individuals' subjective well-being. Subjective well-being, a concept that includes life satisfaction, can also be called happiness [35]. The HRG Korean also showed a positive correlation with subjective happiness in this study. In particular, the commitment subscale is closely related to subjective happiness and well-being. This suggests that individuals' tendency to commit themselves can lead them to greater happiness and satisfaction with life. These results demonstrated the satisfactory predictive validity of the HRG Korean.

It is noteworthy that while earlier studies conceived hardiness as a fairly stable trait [6,11], recent work indicates that hardiness is more "trait-like" and can actually grow or increase under certain conditions. For example, leaders can have a positive influence on the hardiness attitudes and coping behaviors of workers throughout their organizations by their personal example and the policies they set [12,36]. Furthermore, Stein and Bartone have described strategies for developing a hardiness mindset, techniques that can be applied by individuals, as well as coaches and teachers, to increase hardiness and stress resilience [37]. By building hardiness, it may thus be possible to strengthen the sustainability of individuals and organizations that are facing stressful and crisis conditions.

There are some limitations to be considered when interpreting the results of this study. First, because data collection was conducted online and stratified samples were not completely extracted, the sample of this study is not perfectly representative of Korean adults. Second, this study did not determine reliability using the test-retest method. However, because the original English version of the HRG scale development study identified high test-retest reliability coefficients, the HRG Korean scale is likely to obtain similar results. Third, all subscales included an item with a relatively low SRW, leading to somewhat low AVEs, especially for the control subscale. Additionally, subscales were rather strongly intercorrelated. Thus, further studies should assess the HRG Korean with other, larger Korean samples. Finally, the covariance levels of items 5 and 6, items 4 and 12, and items 10 and 12 were high. Because there was no theoretical basis for the modified model allowing three error covariances, it is necessary to confirm this phenomenon in further studies. Thus, it would also be useful to explore whether these items perform similarly in other cultures.

5. Conclusions

This study has demonstrated that the HRG Korean can be a useful tool for measuring hardiness in Koreans. Although the factorial structure of the HRG Korean was less satisfactory than expected, the three-factor model (with three error covariances) showed a good factorial structure and an acceptable model fit. The reliability of the HRG Korean estimated with internal consistency was also high. Despite these advantages, additional studies with the HRG Korean should be conducted with larger samples of Koreans.

The HRG Korean has shown excellent concurrent and predictive validity in this study, lending credence to its utility as a comprehensive measure of the hardiness construct. As such, it should prove a useful tool that can be applied by academicians and clinicians to measure hardiness and resilience in the Korean context.

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Institutional Review Board Statement: The study was conducted according to the ethical guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Sahmyook University (protocol code: 2-1040781-A-N-012021025HR; date of approval: 9 April 2021).

Informed Consent Statement: All data were collected with informed consent. For the online survey, the IRB (reference number: 2-1040781-A-N-01) waived the requirement of documentation signature.

Data Availability Statement: The datasets analyzed in the current study are available from the corresponding author upon reasonable request.

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Conflicts of Interest: The authors declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Abbreviations

HRG Korean	Korean Version of the Hardiness Resilience Gauge
DRS	Dispositional Resilience Scale
SNS	Social Networking Service
SPSS	Statistical Package for Social Sciences
AMOS	Analysis of Moment Structure
TLI	Tucker–Lewis Index
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation
SRMR	Standardized Root Mean Square Residual
CR	Composite reliability
AVE	Average Variance Extracted
KHS-SF	Korean version of Hardiness Scale-Short Form
MR-KA	Measure of Resilience
SWLS	Satisfaction with Life Scale
MSH	Measure of Subjective Happiness

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