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ORIGINAL ARTICLE

Validity and reliability of a Korean version of the breast cancer survivors resilience scale

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Abstract

Aim: To examine the resilience of breast cancer patients by investigating the validity and reliability of a Korean version of the breast cancer survivors resilience scale (BCRS) and to provide basic data for developing interventions that can be used by healthcare professionals to enhance the resilience of breast cancer patients.

Methods: Data were obtained from 280 breast cancer survivors receiving treatment at the outpatient clinic of Kosin University Hospital located in Busan City, Korea, and the collected data were used to confirm content validity, construct validity, criterion validity, and internal consistency reliability.

Results: The Korean version of the BCRS comprised two subdomains and a total of 16 items, and the internal consistency reliability estimated by Cronbach's alpha was .87~.89.

Conclusion: This study found that the Korean version BCRS has high validity and reliability. In future studies, it will be necessary to conduct research that identifies the resilience levels of patients with breast cancer, using the Korean version BCRS, and seeks interventions in agreement with the results.

KEYWORDS

breast, neoplasm, reliability, resilience, validation

1 | INTRODUCTION

Cancer is a leading cause of death worldwide, accounting for an estimated 9.6 million deaths in 2018; breast cancer is the most frequently occurring cancer, with an estimated 2.09 million cases diagnosed in 2018 (WHO, 2018). According to the 2017 data announced by the American Cancer Society, 252,710 women in the US were newly diagnosed with breast cancer while approximately 40.610 died of breast cancer (DeSantis, Ma, Goding Sauer, Newman, & Jemal, 2017). In particular, it was observed that the breast cancer incidence rate among Asian women residing in the US had increased every year by 1.7% (DeSantis et al., 2017). The breast cancer incidence rate among Korean women presented by the Korea Central Cancer Registry showed an annual growth rate of 4% from 2007 to 2015, increasing the financial burden of medical expenses for breast cancer treatment in Korean society (Jung, Won, Kong, & Lee, 2019). In addition, healthcare technologies and various clinical treatments are being developed in Korea and the number of breast cancer survivors is increasing as people become more aware of the benefits of early cancer diagnosis (National Cancer Information Center, 2019). In this social context, breast cancer, which was once regarded as a fatal illness, is now perceived as a chronic disease, and therefore, providing continuous management to breast cancer survivors has become one of the important tasks of

healthcare professionals (Valdivieso, Kujawa, Jones, & Baker, 2012).

After going through the proactive cancer treatment stage, breast cancer survivors become more interested in the physical, mental, and social changes that they have to experience as a cancer survivor and adaptation thereto, departing from their previous focus on cancer treatment (DeSantis et al., 2017). Breast cancer survivors sometimes experience limitations in daily life due to various physical changes arising throughout treatment including hair loss, weight gain, mastectomy, paresthesia of the hands or feet, and fatigue. As a mastectomy is one of the most significant factors that can make breast cancer survivors experience the loss of their femininity, most breast cancer survivors report that they feel mental discomfort such as depression and psychological anxiety caused by mastectomy (Oberguggenberger et al., 2018). Moreover, some breast cancer survivors express their difficulties in participating in social activities due to cognitive impairment that occurred during treatment (Panjari, Bell, & Davis, 2011). Having experienced the uncertainty of the disease and the difficult treatment process, breast cancer survivors accept themselves as cancer survivors and try to return to their daily lives as before. However, there are many hurdles in front of them. Consequently, given that the number of breast cancer survivors is consistently increasing in modern society, healthcare professionals need to pay attention to the changes and struggles of breast cancer survivors and try to find ways to provide active intervention. In particular, healthcare professionals should help breast cancer survivors enhance their inner strength (resilience), so that breast cancer survivors can positively adapt to their changed situation (Sunaga & Futawatari, 2018).

The resilience of breast cancer survivors offers important momentum for them to lead a more positive life and affects their quality of life (Hsu, Ennis, Hood, Graham, & Goodwin, 2013). The resilience of breast cancer survivors is a kind of muscular strength of mind that enables the survivor to jump higher based on various adversities, and it refers to the emotional capability to overcome failures in one's life while bringing about positive outcomes or reducing negative outcomes (Pieters, 2016). In other words, this is the capability to overcome hurdles and adapt to one's current situation in life, and the resilience of cancer patients is explained as an important psychosocial variable that intervenes in negative circumstances caused by illness and enhances or facilitates the patient's capabilities that are required for emergencies (Haase, 2004). Ultimately, as resilience refers to a concept that includes an individual's capability to understand and address a stressful situation caused by illness as well as belief and purpose in life (Polk, 1997), enhancing the resilience of breast cancer survivors, in the process of providing nursing services, gives them a momentum to address many physical and psychological problems on their own and to positively adapt to the changes in their lives (Sunaga & Futawatari, 2018).

Enhancing the resilience of breast cancer survivors plays an important role in allowing breast cancer survivors to continue their lives, so it is important for healthcare professionals to measure the accurate level of individual survivor resilience to enhance resilience of breast cancer survivors (Haase, 2004). As for the scales used to measure the resilience of cancer survivors, most previous studies did not utilize scales developed for cancer survivors but they used the 10-item Conner-Davidson Resilience Scale (CD-RISC) that was revised and supplemented by Campbell-Sills and Stein (2007) from the 25-item CD-RISC developed by Connor and Davidson (2003) for ordinary outpatients, outpatients with mental illness, and patients under anxiety disorder and post-traumatic stress disorder clinical trial patients. And some of the previous studies were reported to have translated the resilience scale developed by Wagnild and Young (1993) for the elderly in the community and applied it to cancer survivors. However, breast cancer usually plagues women and thus, a scale is required to confirm the distinctiveness of resilience held by breast cancer survivors.

Recently, a resilience scale for breast cancer survivors, called the breast cancer survivors resilience scale (BCRS), was developed in Japan, and it is expected that the level of resilience of breast cancer survivors can be measured using the scale and related research will be vibrantly conducted (Sunaga & Futawatari, 2018). Especially, the BCRS was developed only for the purpose of measuring resilience of breast cancer survivors, and as the scale contains both individual and social factors, it has a high level of validity and reliability and based on the scale, healthcare professionals can consider intervention for resilience of breast cancer survivors not only from an individual perspective but also from a social perspective. According to Sunaga and Futawatari (2018), the resilience of breast cancer survivors is defined as an ability to maintain a psychological health condition even if exposed to a stressor; alternatively, it is an ability to overcome a temporary maladaptive status and recover toward a healthy condition. And the resilience of breast cancer survivors may be promoted by the interplay between external support from parties like medical professionals, family, and the social environment and internal competence such as personal attributes and cognitive appraisal. While the resilience of breast cancer survivors is an important factor for the individual's ability to cope with

the stresses associated with the disease, other breast cancer survivors can help themselves ease the psychological burden associated with the disease and reaffirm their role in daily life. Thus, resilience of breast cancer survivors needs to include both individual and social prospective factors. Given this, the BCRS was developed exclusively for the purpose of measuring resilience of breast cancer survivors. It has a high level of validity and reliability because the scale contains both individual and social factors. And based on the scale, healthcare professionals can consider resilience intervention for breast cancer survivors not only from an individual perspective but also from a social perspective. Especially, specific interventions can be implemented as to any low-scoring items identified by the BCRS. In cases where problems are predicted in connection with treatment or progress of the disease, the scale could be useful for formulating an approach for assessment or preventive intervention. Therefore, considering the constant rise in the number of breast cancer survivors in Korea and breast cancer survivors are those who should overcome the cancer and have both their own role of maintaining daily life and female role of caring about their families, and have complex problems such as the loss of a body part to maintain their female sex identity, studies need to be conducted to enhance the resilience of breast cancer survivors and particularly, a scale is necessary to measure resilience of breast cancer survivors in Korea. In this regard, this study aims to evaluate the validity and reliability of a Korean version of the BCRS.

2 | METHODS

2.1 | Study design

This study was a methodological research conducted to validate a Korean version of the BCRS developed by Sunaga and Futawatari (2018) to measure the resilience of breast cancer survivors.

2.2 | Participants

This study collected data from 280 breast cancer survivors who were receiving treatment at the outpatient clinic of a hospital located in Busan City, Korea. According to the definition by the National Coalition for Cancer Survivorship (2008), cancer survivors refer to those who have been under treatment since being diagnosed with cancer or those who have completed cancer treatment. Moreover, cancer survivors used to mean those who survived for more than 5 years without evidence of recurrence or metastasis after cancer treatment, but in recent years the meaning has been expanded to include all patients who have survived the diagnosis, and their families and caregivers (Hewitt, Greenfield, & Stovall, 2005). In addition, American Society for Clinical Oncology recommends that postoperative clinical examinations be performed every 3 to 6 months during the first 3 years, which is similar to the recommendations of the Korean Breast Cancer Society (Chae, Song, & Jung, 2009). Especially, according to Korean Breast Cancer Society recommendation, stage 0 breast cancer is classified into intraepithelial carcinoma and lobular carcinoma, and treatment of stage 0 breast cancer is similar to stage 1 or 2 breast cancer. So subjects in this study included breast cancer survivors with stage 0. Accordingly, this study selected participants among breast cancer survivors who had received outpatient treatment for 3 months or longer after being diagnosed with breast cancer and receiving surgical treatment, were 65 or younger, had not suffered the spread of breast cancer to other organs, who understood and consented to the purpose and procedure of this study after being informed thereof, and who had no difficulties in reading and understanding the Korean language. Breast cancer patients in the terminal stage were excluded from this study. In this study, factor analysis was used as a major analysis method, and to conduct factor analysis for validity analysis, the number of respondents needs to be 5–10 times the number of expected items (Gorsuch, 1990). Therefore, in consideration that the BCRS has 16 items and on the grounds that exploratory factor analysis and confirmatory factor analysis should be conducted for different participant groups (Hinkin, 1998), we recruited 80 people for the first validation (exploratory factor analysis) and 200 people for the second validation (confirmatory factor analysis). It was confirmed that 280 was the appropriate sample size to conduct this study.

3 | MEASUREMENTS

3.1 | BCRS

In this study, we used the BCRS developed by Sunaga and Futawatari (2018) after obtaining approval from the authors. The scale consists of 16 items, including 11 items on individual factors and five items on social factors. Each item uses a four-point scale ranging from one (totally disagree) to four (absolutely agree), with a higher score indicating a higher level of resilience of the breast cancer patient. When the scale was developed by Sunaga and Futawatari (2018), the reliability of the scale was estimated as Cronbach's alpha = .84.

3.2 | Resilience

In this study, the Korean version of the 10-item CD-RISC (2007) which was revised and supplemented by Campbell-Sills and Stein from the 25-item CD-RISC (2003) developed by Connor and Davidson was provided and used upon the approval of the original authors. The scale consists of a total of 10 items and each item is structured on a five-point scale ranging from one (absolutely not) to five (it is almost always so) with a higher score indicating a higher level of resilience. When the scale was developed, reliability was estimated as Cronbach's alpha = .85, while the reliability of the scale in this study was estimated as Cronbach's alpha = .93.

3.3 | Data collection procedure

This study collected data between December 26, 2018 and September 25, 2019 from 280 breast cancer survivors who were receiving treatment at the outpatient clinic of a hospital located in Busan City, Korea. Only those who consented to participate in this study were selected with cooperation of the relevant department, and study participants were informed of the purpose of the study in plain and understandable language and were also informed that the collected data would be used only for academic purposes, all personal information would be used for the purpose of data review, and the name of participants would be treated anonymously and in statistics format throughout the actual analysis procedure. Data collection was conducted before and after treatment hours so as not to interrupt treatment, and participants were also informed that they had a right to withdraw from the study at any time and all or part of their information could be deleted upon request. Other matters prescribed under the Bioethics and Safety Act were additionally notified.

Items used in this study were finalized through the stages of primary translation, review by an expert panel, reverse translation, and cognitive evaluation based on the World Health Organization guidelines for the process of translation and adaptation of instruments (World Health Organization, 2012) which is recommended for applying an English instrument to other languages and cultures. Before primary translation, we obtained approval from the scale developer for the Korean translation and use of the scale. It was recommended that it would be appropriate for a healthcare professional who is familiar with technical terms of the relevant sector as well as the culture of English-speaking countries and whose native tongue is the target language of translation to perform the primary translation. In this study, we commissioned two people with a doctoral degree in nursing science and with sufficient knowledge of technical terms of the nursing sector as well as a good command of English to conduct primary translation. First, the two translators independently translated the scale and with their individual translations, they agreed upon the finalized version of primary translation by avoiding and removing literal translations so that it would convey the meaning of sentences, rather than just the individual words. Following this, an expert panel consisting of two nursing professors who are fluent in English, a breast clinic specialist, and the two doctors of nursing science who were responsible for primary translation performed the translation review by comparing the original text with the translated text. In the process, the panel checked the consistency between the original and translated texts and the accuracy of translation, and went through the stages of partial revision and supplementation of the translated text in consideration of readability and cultural differences. Following this, a native English speaker who was also fluent in Korean performed the reverse translation. It was confirmed that the reverse-translated sentences were not exactly identical to the sentences in the original scale but there were no changes in meaning. Therefore, the primary translation of the scale was complete. With the translated version, we confirmed content validity with a breast clinic specialist, two doctors of nursing science with clinical nursing experience of 10 years or more, and two nursing professors.

3.4 | Data analysis

IBM Statistics AMOS 22.0 program and SPSS Statistics 20 were employed to analyze the collected data. General characteristics of the participants were confirmed with frequency, percentage, mean, and standard deviation. Items with a Content Validity Index (CVI) of 0.8 or higher were selected through content validity in this study. After conducting random case sampling of the data of all participants, exploratory factor analysis was conducted for 80 data. In consideration of the correlation between factors and principal axis factor analysis, which is appropriate for selecting a model, this study applied varimax rotation. In exploratory factor analysis, if the Kaiser-Meyer-Olkin (KMO) value is above .50, there is no problem in conducting factor analysis and factor loading value recommended at least 0.4, eigen value 1.0 or higher, and cumulative variance of 50–60% or higher (Kang, 2013). A communality below 0.3 indicates that the variable may have little in common with any of the other variables and was dropped from the analysis (Tabachnick & Fidell, 2007). For the remaining data, we

conducted confirmatory factor analysis to test the measurement equivalence of the Korean version of the scale. After reviewing variate normality, bootstrapping was employed for the estimates that did not satisfy multivariate normality. The goodness-of-fit index of the model was confirmed with χ^2 statistic (degrees of freedom, p-value), normed χ^2 (NC), standardized root mean residual (SRMR), Turker-Lewis index (TLI), and root mean square error of approximation (RMSEA). And to confirm convergent validity of factor construction, we applied the criteria of standardized regression coefficient of the observed variable of .50 or more, construct reliability (CR) of 0.7 or more, and average variance extracted (AVE) of 0.5 or more (Pett, Lackey, & Sullivan, 2003). We tested discriminant validity of factor construction on the criteria that correlation coefficient between factors should not exceed .80, and the AVE of the latent variable should exceed the square of the correlation coefficient between latent variables. In item analysis, we conducted multitrait/multi-item matrix analysis. Convergent validity of the item was tested by confirming whether the item-total correlation was .40 or more, and discriminant validity of the item was tested by examining whether the difference in correlation coefficient between the relevant lower area of each item and another area exceeded a value calculated by doubling the standard error of correlation coefficient (Pett et al., 2003). Mean, standard deviation, standard error, skewness, and kurtosis of the item were calculated. In the item analysis, the ceiling effect and the floor effect were analyzed, and more than 30% of items are excluded (Kane, 2006). For criterion validity analysis, Pearson's correlation coefficient of the Korean version of the BCRS and the Connor-Davidson Resilience Scale was calculated, and internal consistency Cronbach's alpha correlation coefficient and Cronbach's α values of .70 and .80 are good for internal consistency reliability, and .80 and .90 are very high. (Iacobucci & Duhachek, 2003).

3.5 | Ethical consideration

This study was conducted after approval from the institutional review board of Kosin medical center (IRB NO. 2018-10-008-003).

4 | RESULTS

4.1 | General characteristics of participants

The participants' average age was 54.7 ± 7.51. Their marital status showed 205 (73.1%) married and 75 (26.9%) unmarried people. And 29 (10.4%) with zero children, 66 (23.4%) with one child, 142 (50.8%) with two children, 43 (15.4%) with more than three. Currently, whether they had a job showed 102 (36.5%) with a job, 178 (63.5%) with no job. Their monthly income showed 124 (44.2%) with less than one million won, 42 (15.0%) with less than one to two million won, 58 (20.8%) with less than 2–3 million won and 56 (20.0%) with over 3 million won. The period of fighting against breast cancer was an average of 55.07 ± 50.07 months, and the stage of breast cancer diagnosis

TABLE 1 Exploratory factor analysis of breast cancer survivors resilience scale

Factors and items	Factor loading 1	2	Communality
Factor 1: Individual protective factor			
1. Ability to control emotions	.64	.15	.43
2. Belief in self	.65	.16	.45
3. Ability to change mood	.71	.15	.52
4. Belief that the future is bright	.72	.18	.54
5. Optimistic personality	.68	.04	.46
6. Looking at the positive side of things	.73	.04	.53
7. Living life in an easy-going manner	.67	.13	.46
8. Accepting the circumstances	.78	.10	.61
9. Resolving to live with one's disease	.59	.25	.41
10. Willingness to do anything one can	.56	.32	.41
11. Being honest about one's feelings	.51	.12	.30
Factor 2: Social protective factor			
12. Being encouraged by fellow survivors	.18	.79	.65
13. Finding solace in talking to fellow survivor	.19	.82	.70
14. Exchanging information with fellow survivors	.14	.89	.82
15. Sharing experiences with fellow survivors	.15	.87	.78
16. Being useful to fellow survivors	.21	.83	.73
Eigen value	6.28	2.53	
% of variance	30.90	24.17	
% of cumulative	30.90	55.07	

TABLE 2 Confirmatory factor analysis of breast cancer survivors resilience scale

Items	β	β's 95%CI	SE	*p*	CR	AVE
Factor 1: Individual protective factor					**.94**	**.58**
1. Ability to control emotions	.61	(.53, .70)	.12	<.001		
2. Belief in self	.63	(.55, .71)	-	-		
3. Ability to change mood	.69	(.57, .78)	.12	<.001		
4. Belief that the future is bright	.70	(.61, .78)	.15	<.001		
5. Optimistic personality	.61	(.49, .70)	.15	<.001		
6. Looking at the positive side of things	.66	(.55, .74)	.13	<.001		
7. Living life in an easy-going manner	.64	(.54, .73)	.13	<.001		
8. Accepting the circumstances	.75	(.65, .81)	.12	<.001		
9. Resolving to live with one's disease	.60	(.52, .70)	.14	<.001		
10. Willingness to do anything one can	.59	(.50, .67)	.12	<.001		
11. Being honest about one's feelings	.50	(.41, .60)	.13	<.001		
Factor 2: Social protective factor					**.93**	**.73**
12. Being encouraged by fellow survivors	.73	(.63, .81)	.08	<.001		
13. Finding solace in talking to fellow survivor	.78	(.70, .85)	.08	<.001		
14. Exchanging information with fellow survivors	.90	(.87, .94)	.08	<.001		
15. Sharing experiences with fellow survivors	.88	(.82, .93)	.07	<.001		
16. Being useful to fellow survivors	.81	(.73, .85)				

Abbreviations: AVE, average variance extracted; β, standardized estimate; CI, confidence interval; CR, construct reliability; SE, standard error.

showed 27 (9.6%) with cancer in situ, 83 (30.0%) with stage 1, 123 (43.9%) with stage 2, 25 (8.8%) with stage 3, 22 (7.7%) with stage 4. The type of breast cancer surgery showed 77 (27.5%) with a complete mastectomy undergone in one breast, 17 (6.1%) with complete mastectomy of both breasts, 151 (53.8%) with partial mastectomy in one breast, 16 (5.8%) with partial mastectomy in both breasts, and 19 (6.8%) with other types of mastectomy.

4.2 | Content validity

To secure content validity, we went through a strict and systematic translation procedure of the original scale developed in English following the World Health Organization (2012) process of translation and adaptation of instruments. A breast clinic specialist, two doctors of nursing science with clinical nursing experience of 10 years or more, and two nursing professors confirmed content validity. By reviewing item adequacy, item sufficiency, and representation of the subdomain, we confirmed Scale-level Content Validity Index /AVE among the I-CVI and the Scale-level Content Validity Index (S-CVI). In this study, I-CVI was observed at .80–1.00 and S-CVI was at .88, and consequently, appropriate content validity was secured. Among the items, those that had some inappropriate terms not consistent with the reality in Korea and some awkward expressions and phrases were revised, in the original BCRS in English, the question items ended with nouns, but in the Korean version, they were modified so that they ended with verbs due to Korean cultural differences, and then the researchers met with three breast cancer survivors to whom the scale would be actually applied and they secured content validity through cognitive validity evaluation.

TABLE 3 Correlation among factors of breast cancer survivors resilience scale and Connor-Davidson Resilience Scale

Variables	Individual protective factor (*p*)	Social protective factor (*p*)
Individual protective factor	.58	
Social protective factor	.42	.73
Connor-Davidson Resilience Scale	.75	.50

Note: The oblique shaded section: discriminant validity, the non-shaded section: correlation.

TABLE 4 Multi-trait/multi-items matrix analysis

Items	Mean	Standard deviation	Skewness	Kurtosis	Ceiling effect (%)	Floor effect (%)	Correlation between each item and total score of subfactor		
							Factor 1	Factor 2	2*standard error
Factor 1: Individual protective factor (Cronbach's α = .88)									
1. Ability to control emotions	3.05	.67	−.51	.80	22.4	2.2	**.65***	.26*	.09
2. Belief in self	3.15	.68	−.53	.48	29.8	1.8	**.67***	.27*	.09
3. Ability to change mood	2.94	.65	−.41	.65	16.2	2.2	**.71***	.28*	.09
4. Belief that the future is bright	2.88	.77	−.60	.35	18.0	6.1	**.73***	.32*	.10
5. Optimistic personality	2.82	.79	−.33	-.23	18.4	5.3	**.66***	.21*	.10
6. Looking at the positive side of things	3.08	.68	−.44	.34	25.9	1.8	**.71***	.21*	.09
7. Living life in an easy-going manner	2.82	.69	−.47	.46	12.3	3.9	**.67***	.28*	.09
8. Accepting the circumstances	3.06	.64	−.36	.57	21.9	1.3	**.76***	.27*	.08
9. Resolving to live with one's disease	2.97	.75	−.53	.24	22.8	3.9	**.65***	.34*	.10
10. Willingness to do anything one can	3.07	.68	−.34	.07	25.0	1.3	**.64***	.38*	.09
11. Being honest about one's feelings	3.05	.71	−.45	.14	25.9	2.2	**.57***	.27*	.09
Factor 2: Social protective factor (Cronbach's α = .91)									
12. Being encouraged by fellow survivors	2.82	.85	−.50	−.24	20.2	8.8	.35*	**.82***	.11
13. Finding solace in talking to fellow survivor	2.92	.84	−.48	−.28	25.0	6.1	.36*	**.85***	.11
14. Exchanging information with fellow survivors	2.89	.87	−.55	−.27	25.0	8.3	.34*	**.90***	.12
15. Sharing experiences with fellow survivors	2.93	.83	−.48	−.22	25.0	5.7	.35*	**.88***	.11
16. Being useful to fellow survivors	2.73	.85	−.32	−.25	14.9	7.0	.39*	**.85***	.11

*$p < .001$.

4.3 | Construct validity

We conducted exploratory factor analysis for a total of 16 items and applied principal component factor analysis and varimax rotation. The KMO value to confirm adequacy of factor analysis sample was .89, which was higher than the cutoff value of .80, and the Bartlett's test of sphericity result displayed that approximate χ^2 value was 1814.06 (df = 120, $p < .001$), showing that it was appropriate to employ factor analysis. Factor analysis results of all of the 16 items extracted two factors with initial eigenvalues of 1.0 or more. Communality of the item was .30 or more for all items, and every item satisfied the criteria of factor loading of .40 or more. As a result of exploratory factor analysis, the number of total items was maintained at 16, as it was initially set (Table 1).

In this study, confirmatory factor analysis was conducted for 16 items in two subfactors. The goodness-of-fit index of the model showed that χ^2 was 240.04 (df = 101, $p < .001$), NC was 2.38, SRMR was .06, TLI was .91, and RMSEA was .08 (low = .07, high = .09), confirming that the goodness-of-fit met the criteria. Convergent validity and discriminant validity were confirmed with the finally determined model. The standardized regression coefficient of all items was in a statistically significant range of .50~.90, composite reliability was .93 or more, and AVE index was .58 or more (Table 2) (Appendix S1). In this study, it was observed that Pearson's correlation coefficient between individual protective factor and social protective factor was .42 ($p < .001$), confirming the convergent validity of factors. In addition, correlation coefficient between factors was checked to confirm discriminant validity of factor construct and it was .80 or less, and inter-factor correlation coefficient values (r = .42) were all lower than the square root of the AVE. Therefore, discriminant validity of factors was confirmed (Tables 2 and 3).

4.4 | Item analysis

Item analysis was conducted to confirm convergent validity of the item and adequacy of internal structure of the subdomain. Item mean was 2.73~3.15 and standard deviation was 0.64~0.87. Based on such results, it was concluded there were no items with an extreme value, and normal distribution was confirmed as there were no values of skewness and kurtosis exceeding ±2. To confirm convergent validity and discriminant validity of the item, we examined the Item-Total Coefficient of an item of the subfactor and all of the remaining items. As a result, correlation coefficients were revealed to be in the range of .34~.90 (Table 4), and for all of the items (100%), the difference in correlation coefficient between the relevant subdomain of each item and other domains exceeding a value calculated by doubling the standard error of correlation coefficient. In this study, the ceiling effect and the floor effect were identified in all items, and there was no item below the standard value of 30%.

4.5 | Criterion validity

The correlation between a Korean version of the BCRS and Connor-Davidson Resilience Scale was analyzed, and it was revealed that there was a positive correlation (individual protective factor: r = .75, $p < .001$), social protective factor: r = .50, $p < .001$) (Table 3).

4.6 | Reliability

The internal consistency reliability test result of the Korean version of the BCRS revealed that Cronbach's alpha of the subfactor was .88–.91.

5 | DISCUSSION

This study was conducted to confirm the validity of the Korean version of the BCRS, and our discussion is centered on the validation process. First, to secure content validity of the Korean version of the BCRS, we fully implemented the process of translation and adaptation of instruments presented by the World Health Organization; reviewed the item sufficiency and representation of subdomains through an expert panel consisting of a breast clinic specialist, nursing professors and other experts; and obtained the result of cognitive validity evaluation by breast cancer survivors.

To confirm the construction validity of the Korean version of the BCRS, we conducted exploratory factor analysis, confirmatory factor analysis, and criterion validity analysis. As confirmatory factor analysis is more appropriate where a previously validated instrument is translated into another language and applied (Geldhof, Preacher, & Zyphur, 2014), we first conducted exploratory factor analysis and then conducted confirmatory factor analysis to confirm whether components developed in Japan were appropriate in Korea as well. Exploratory factor analysis was conducted for all of the 16 items, and analysis results showed that the Korean version of the BCRS consisted of two subdomains and a total of 16 items, and confirmatory factor analysis result also confirmed that it consisted of a total of 16 items. Based on the results of this study, it was revealed that the Korean version of the BCRS consisted of the identically structured subdomains and specific items as those structured at the time of development of the BCRS, reaffirming that the resilience of breast cancer patients contains both individual and social aspects. From these findings, it is considered that the enhancement of the individual's ability to cope with stresses associated with the disease is an important factor in the resilience of breast cancer survivors, and particularly that positive psychology about oneself such as self-esteem and self-trust enhances subjects' resilience. In addition, the factor of social support from other breast cancer survivors based on their same experiences helps patients with breast cancer relieve psychological burden associated with the disease and perform their roles effectively and efficiently. This was the basis for the Adolescent Resilience Model (Haase, 2004) at the time of the development of BRCS,

and was reaffirmed by the present study, and was confirmed by the existing resilience measurement tools revolving around the individual's internal competence. Overall, it presumed that BRCS is meaningful in that it considers various aspects, including the social protective factor, that can enhance breast cancer survivors' resilience.

Moreover, we reviewed convergent validity and discriminant validity of the construct factors determined through confirmatory factor analysis, and as a result, it was confirmed that the Korean version of the BCRS was an instrument with validity. Criterion validity was confirmed through the correlation coefficient of the Korean version of the BCRS and the Connor-Davidson Resilience Scale, and the correlation coefficient between the two scales was observed as r = .50–.75. Based on the result of validity evaluation through correlation coefficient estimation, it can be said that the Korean version of the BCRS is a validated instrument for assessing the resilience of breast cancer survivors on the criteria that a correlation coefficient of .60–.80 means "a high validity," while a correlation coefficient of .80–1.0 means "a very high validity" (Seong, 2010). In this study, internal consistency reliability of the Korean version of the BCRS estimated by Cronbach's alpha was .88~.91, while reliability at the time of development of the BCRS estimated by Cronbach's was .88~.84: confirming that the Korean version of the BCRS is also a highly reliable instrument.

The results of this study show that the Korean version of the BCRS is a scale with high validity and reliability for measuring the resilience of breast cancer patients, which has already been confirmed in Japan to support the validity and reliability of this scale. Therefore, it can be used to confirm and improve the resilience of breast cancer patients and to provide effective nursing care. Especially, it is expected that the Korean version of the BRCS reviewed by this study will be basic data for identifying the resilience levels of patients with breast cancer, considering nursing interventions in terms of factors in personal protection and social protection, and applying interventions relating to them. However, this study has the limitation that it failed to apply the test–retest method for finding how stable respondents' responses to the scale were.

6 | CONCLUSION

This study found that the Korean version of the BCRS consists of two factors and 16 question items in total and has high validity and reliability. In future studies, it is necessary to conduct research that identifies the resilience levels of patients with breast cancer, using the Korean version BCRS, and seek interventions in agreement with the results.

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CONFLICT OF INTERESTS

The authors of this paper have no conflicts of interest to report.

AUTHOR CONTRIBUTIONS

J-W.H and J.M.K contributed to the conception and design of this study and J.H.C carried out the data collection; J-W.H conducted the statistical analysis and J-W.H and J.M.K drafted the manuscript; and J-W.H, J.M.K and J.H.C critically reviewed and made revisions to the paper regarding important intellectual content.

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SUPPORTING INFORMATION

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