

# Psychometric Characteristics of the Fear of Cancer Recurrence Inventory-Severity Subscale Among Korean Cancer Survivors

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**Objectives:** Despite the importance of choosing and using a valid assessment tool for fear of cancer recurrence (FCR) for early detection and interventions, the validity of the FCR inventory has yet to be thoroughly investigated in Korea. This study explored the psychometric properties of the Fear of Cancer Recurrence Inventory-Severity (FCRI-S) subscale and assessed its applicability to cancer survivors in Korea.

**Methods:** The survey involved 93 Korean individuals who had survived cancer. The reliability of the FCRI-S subscale was assessed using Cronbach's  $\alpha$  and composite reliability (CR). Confirmatory factor analysis (CFA), along with tests for discriminant and convergent validity, was conducted to evaluate the construct validity of the FCRI-S subscale.

**Results:** The FCRI-S subscale showed excellent internal consistency (Cronbach's  $\alpha=0.88$ ; CR=0.89). CFA showed a good factor structure for the FCRI-S subscale, and the correlations of the FCRI-S subscale with FCR-related measures ( $r=0.69$  to  $0.80$ ) and other psychosocial measures ( $r=-0.23$  to  $0.37$ ) confirmed both the convergent and discriminant validity of the FCRI-S subscale.

**Conclusions:** This study confirmed the robust psychometric characteristics of the FCRI-S subscale among cancer survivors in Korea. The use of the FCRI-S subscale would be helpful for health professionals to rapidly screen FCR levels in clinical settings.

**Key words:** Cancer survivors, Fear, Recurrence, Psychometrics

## INTRODUCTION

Fear of cancer recurrence (FCR) is increasingly recognized due to its high prevalence and its negative impact on the mental health and quality of life of cancer survivors. FCR generally refers to the fear or worry that cancer will return or progress [1]. It is known to persist over time, and many cancer survivors ex-

perience FCR to varying degrees [2-4]. A systematic review indicated that between 20% and 90% of cancer survivors exhibit moderate to severe FCR across different samples [5]. Another recent study, which included 46 studies from 13 countries, found that 58.8% of cancer survivors experienced moderate to severe levels of FCR, and 19.2% displayed clinical levels of FCR, as measured by a Fear of Cancer Recurrence Inventory-Severity (FCRI-S) subscale score of 22 points or higher [6]. The broad range of FCR prevalence reported in previous studies suggests that the assessment tools for FCR have varying cut-off points for determining clinical levels. Moreover, symptoms of FCR can be perceived and interpreted differently by individuals, societies, and cultural backgrounds. Therefore, it is crucial to select and utilize a cross-culturally comparable FCR assessment measure that possesses robust psychometric properties.

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The FCRI, which has 42 items, is a well-known measure for assessing FCR. This inventory measures 7 domains: “triggers” (8 items), “severity” (9 items), “psychological distress” (4 items), “coping strategies” (9 items), “functioning impairments” (6 items), “insight” (3 items), and “reassurance” (3 items) [7]. The FCRI has shown excellent reliability and validity and is widely used across different populations and regions [8-10]. However, using the full FCRI can be cumbersome, hindering its use for effectively screening cancer survivors with severe FCR symptoms. Consequently, the 9-item FCRI-S subscale (corresponding to the severity subscale of the FCRI) has been proposed as an alternative for rapidly and efficiently screening FCR [11]. Previous research [11,12] has shown that the FCRI-S subscale can serve as a valuable clinical tool for evaluating the impact and intrusiveness of FCR in cancer survivors.

In Korea, cancer is the leading cause of mortality, responsible for 26% of all deaths [13]. The cancer incidence rate in Korea is expected to decrease slightly in 2023 [14]. Meanwhile, the 5-year relative survival rate for Korean cancer survivors has improved from 65.5% during 2006-2010 to 72.1% during 2017-2021 [15]. As a consequence of the increase in cancer survival rates, individuals who have survived cancer may face long-term vulnerabilities in terms of physical challenges (recurrence, second cancer, side effects), psychological issues (depression, anxiety, FCR) and other difficulties (role changes in the family life, lack of health information, communication issues with health professionals) [16,17]. These issues have been substantiated by Korean research on cancer survivorship and the unmet needs of cancer patients [17-19]. Although a previous empirical study [10] conducted a psychometric evaluation of the Korean version of the FCRI, the reliability and validity of the FCRI-S subscale have yet to be thoroughly examined in Korea.

Therefore, this study aimed to validate the FCRI-S subscale among cancer survivors in Korea. Specifically, this study evaluated the psychometric properties of the FCRI-S subscale, including its internal consistency and construct validity, to demonstrate its applicability in the Korean context.

## METHODS

### Study Procedures and Participants

The present study utilized a purposive snowball sampling strategy. The inclusion criteria comprised Korean cancer survivors who: (1) were aged 19 years and older; (2) had been diag-

nosed with any type of cancer at least 3 months prior to participating in this survey; and (3) had completed active hospital-based treatment, including surgery, chemotherapy, and radiation therapy, and were receiving outpatient follow-up.

To recruit study participants, we contacted medical social workers at general or local hospitals via email. We informed them about the current study and requested that they distribute a research survey flyer to eligible cancer survivors. Potential participants could take part in this study via an anonymous online survey link. Before completing the survey, all participants reviewed the study's objectives and procedures and provided electronic informed consent by selecting the “I agree” box. Data collection occurred from May 2022 to September 2022.

A total of 95 Korean cancer survivors completed the online survey. However, 2 questionnaires (2.1%) did not meet the established inclusion criteria and were therefore excluded from the analysis, leaving 93 surveys eligible for data analysis. There were no dropouts among the survey participants. As a token of appreciation for their time, all study participants received a 5000 Korean won convenience store coupon upon completing their survey.

## Measures

### FCRI-S subscale

The FCRI is a comprehensive self-report inventory consisting of 42 items across 7 domains: “triggers” (8 items), “severity” (9 items), “psychological distress” (4 items), “coping strategies” (9 items), “functioning impairments” (6 items), “insight” (3 items), and “reassurance” (3 items) [7]. In this study, the Korean version of the FCRI-S subscale was used to assess the intrusiveness and severity of thoughts related to FCR [10]. Respondents rated each item on a scale from 0 to 4, with responses ranging from “never/not at all” to “all the time/a great deal.” One positively worded item (“I believe that I am cured and that the cancer will not come back”) was reverse coded. Higher scores indicate more pronounced FCR. The FCRI-S subscale has been validated and demonstrated high internal consistency [7,10,12]. In this study, the internal consistency was good (Cronbach's  $\alpha=0.88$ ).

### CWS

This study utilized the 8-item Cancer Worry Scale (CWS) to evaluate the degree of concern regarding recurrent cancer and its impact on daily activities [20]. Each item is rated on a scale from 1 to 4, with response options ranging from “never” to “almost always.” Higher scores indicate greater cancer-relat-

ed worries. Previous studies have demonstrated that the CWS possesses strong validity and reliability [20,21]. In this study, the internal consistency was high (Cronbach's  $\alpha=0.93$ ).

#### FoP-Q-SF

This study used the Fear of Progression Questionnaire-Short Form (FoP-Q-SF; 12-item version) to assess fear of cancer progression [22]. Each item is rated on a scale from 1 to 5, with options ranging from "never" to "all the time." Higher scores indicate a more intense fear of cancer progression. Previous research has demonstrated that the FoP-Q-SF instrument possesses good validity and reliability [22,23]. In this study, the internal consistency was excellent (Cronbach's  $\alpha=0.94$ ).

#### PHQ-9

The Patient Health Questionnaire-9 (PHQ-9), a brief self-administered instrument, was utilized to measure and monitor depression symptoms [24]. Study participants rated each statement on a scale from 0 to 3, with responses varying from "not at all" to "nearly every day." Higher scores reflect more severe depressive symptoms over the past 2 weeks. Previous research has demonstrated that the PHQ-9 possesses strong psychometric properties [24,25]. In this study, the internal consistency was high (Cronbach's  $\alpha=0.92$ ).

#### MOS-SSS

This study used the 19-item Medical Outcomes Study-Social Support Survey (MOS-SSS) to assess social support experiences among cancer survivors [26]. This instrument includes 4 components: "emotional/informational support" (8 items), "tangible support" (5 items), "affection" (3 items), and "positive interaction" (3 items) [26]. Each item is rated on a scale from 1 to 5, with options ranging from "none" to "all of the time." Higher scores suggest a greater likelihood of receiving social support. Previous studies have documented the psychometric properties of the MOS-SSS, and it demonstrated excellent internal consistency in our study (Cronbach's  $\alpha=0.98$ ) [26].

### Statistical Analysis

First, we summarized the socio-demographic characteristics of the participants and their cancer-related features using descriptive statistics. Second, we assessed the reliability of the FCRI-S subscale using measures of internal consistency, including Cronbach's  $\alpha$  and composite reliability (CR). CR evaluates how consistently indicator variables reflect a latent variable

and provides a reliability estimate that is less biased than that of Cronbach's  $\alpha$  [27]. Third, we measured the construct validity of the FCRI-S subscale through confirmatory factor analysis (CFA), convergent validity, and discriminant validity tests. For the CFA, we assessed model fit using several goodness-of-fit indices: the chi-square test, comparative fit index (CFI), standardized root mean residual (SRMR), and root mean square error of approximation (RMSEA). Convergent validity was determined by estimating the correlation coefficients among 3 FCR-related scales: the FCRI-S subscale, the CWS, and the FoP-Q-S. Discriminant validity was evaluated by examining the correlation coefficients between the FCRI-S subscale and other psychosocial measures, specifically the PHQ-9 and MOS-SSS. The CFA and CR tests were conducted using Mplus 8.0, while the descriptive statistics, Cronbach's  $\alpha$ , and correlation data were analyzed using SPSS version 24.0 (IBM Corp., Armonk, NY, USA).

### Ethics Statement

The survey process for this study commenced following the institutional review board's review and approval of all research activities, in accordance with the Helsinki Declaration (Reference No. 202204-0026-01). Study respondents voluntarily provided informed consent online.

## RESULTS

Table 1 presents the socio-demographic and cancer-related characteristics of the study participants. The average age of the participants was 48.9 years, with a range from 20 years to 82 years. The majority of the survey respondents were female (81.7%), married (75.3%), and had attained a college education

**Table 1.** Participants' socio-demographic and cancer-related characteristics (n=93)

Characteristics	n (%)
Age, mean $\pm$ SD [range] (y)	48.9 $\pm$ 12.6 [20-82]
Sex	
Male	17 (18.3)
Female	76 (81.7)
Marital status	
Married	70 (75.3)
Single/Divorced/Other	23 (24.7)
Educational level	
High school graduate or below	32 (34.4)
College graduate or above	61 (65.6)

(Continued to the next page)

**Table 1.** Continued from the previous page

Characteristics	n (%)
Monthly household income (US\$)	
<2000	17 (18.3)
2000-2999	18 (19.4)
3000-3999	12 (12.9)
4000-4999	15 (16.1)
≥5000	31 (33.3)
Employment status	
Yes	53 (57.0)
No	40 (43.0)
Religion	
Yes	66 (71.0)
No	27 (29.0)
Cancer-related characteristics	
Time since cancer diagnosis (y)	
≤1	9 (9.8)
2-5	38 (41.3)
6-10	26 (28.3)
11-15	10 (10.9)
≥16	9 (9.8)
Cancer type	
Breast cancer	38 (44.7)
Blood cancer	24 (28.2)
Thyroid cancer	10 (11.8)
Other	13 (15.3)
Stage of cancer	
0 & I	52 (55.9)
II	23 (24.7)
III	10 (10.8)
IV	8 (8.6)
Metastatic cancer	
Yes	16 (17.2)
No	77 (82.8)
Multiple primary cancer diagnosis	
Yes	8 (8.6)
No	85 (91.4)
Cancer treatment received (multiple response)	
Surgery	67 (30.0)
Chemotherapy	56 (25.1)
Radiotherapy	52 (23.3)
Targeted therapy	12 (5.4)
Hormone therapy	25 (11.2)
Other	11 (4.9)
Self-rated health status	
Poor	22 (23.7)
Fair	28 (30.1)
Good	43 (46.2)

or higher (65.6%). Additionally, 62.3% of the respondents lived in households with an annual income exceeding US\$30 000. Employment was reported by 57.0% of the participants, and 71.0% identified as religious. Regarding cancer-related attributes, about half of the respondents (51.1%) had been diagnosed with cancer within the past 5 years. Breast cancer was the most common diagnosis, accounting for 44.7% of cases, followed by blood cancer at 28.2%. Over half of the respondents (55.9%) had stage 0 or I cancer, while 17.2% reported having metastatic cancer and 8.6% had multiple primary cancer diagnoses. The most frequently reported cancer treatment was surgery (30.0%), followed by chemotherapy (25.1%) and radiotherapy (23.3%). A significant majority (76.3%) of the respondents rated their health status as either fair or good.

Table 2 presents the results of the item analysis and reliability of the FCRI-S subscale. The mean indicators for the FCRI-S subscale varied from 1.04 to 2.59. All correlations between the items of the FCRI-S subscale were statistically significant, with *r*-values ranging from 0.22 to 0.74, except for the correlation between F4 and F5. The corrected item-total correlations spanned from 0.40 to 0.72, demonstrating acceptable values. The Cronbach's  $\alpha$  and CR for the FCRI-S subscale were 0.88 and 0.89, respectively, indicating high internal consistency.

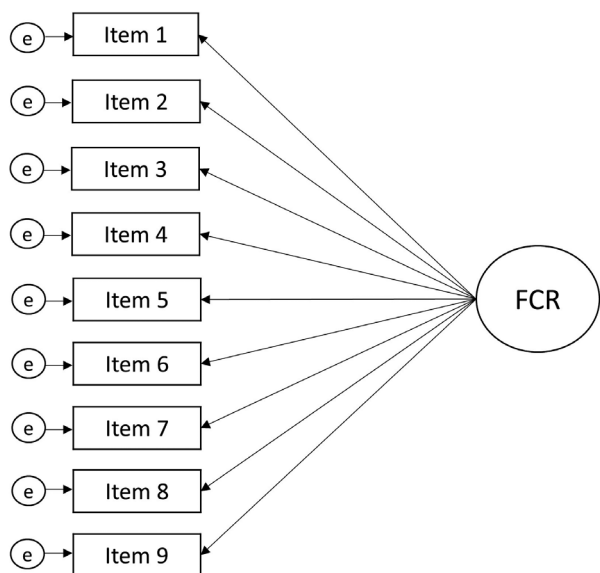
To measure the construct validity of the FCRI-S subscale, the initial CFA model (Figure 1) was tested. However, this model did not demonstrate a satisfactory fit. Drawing on prior studies [9,10] and modification indices, we revised the initial model by incorporating 2 correlated errors between specific items of the FCRI-S subscale (F2 and F6; F7 and F8). Figure 2 displays the revised CFA model for the FCRI-S subscale, which showed improved fit indices:  $\chi^2$  (df=25)=38.777,  $p<0.05$ ; CFI=0.959; RMSEA=0.077; SRMR=0.057. The factor loadings ranged from 0.38 to 0.85 (standardized coefficients), indicating a substantial common variance among the indicators and supporting a robust one-factor structure.

Table 3 presents the correlations between the FCRI-S subscale and other psychosocial evaluation instruments. The FCRI-S subscale score showed a strong correlation with the CWS score ( $r=0.80$ ) and the FoP-Q-SF score ( $r=0.69$ ). Additionally, there were significant correlations between the FCRI-S subscale score and the PHQ-9 score ( $r=0.37$ ), as well as between the FCRI-S subscale score and the MOS-SSS score ( $r=-0.23$ ). However, these correlations were weaker compared to those with FCR-related scales.

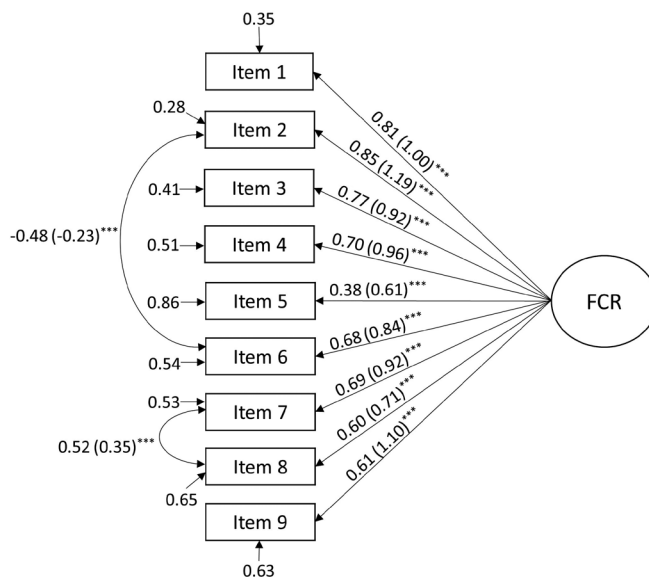
**Table 2.** Item analysis and reliability of the FCRI-S subscale

Item	Mean ± SD	Correlation coefficients between FCRI-S items									Corrected item-total correlations	Cronbach's α	Composite reliability
		Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9			
Item 1	2.23 ± 1.05	1.00									0.72	0.88	0.89
Item 2	2.54 ± 1.18	0.74***	1.00								0.70		
Item 3	2.59 ± 1.01	0.64***	0.67***	1.00							0.68		
Item 4	2.45 ± 1.17	0.57***	0.59***	0.63***	1.00						0.64		
Item 5	2.23 ± 1.38	0.36***	0.22*	0.25*	0.19	1.00					0.40		
Item 6	1.83 ± 1.06	0.46***	0.39***	0.49***	0.44***	0.36***	1.00				0.64		
Item 7	1.66 ± 1.14	0.54***	0.52***	0.48***	0.54***	0.31**	0.56***	1.00			0.72		
Item 8	1.04 ± 1.01	0.44***	0.43***	0.40***	0.50***	0.30**	0.56***	0.71***	1.00		0.63		
Item 9	2.40 ± 1.54	0.43***	0.52***	0.40***	0.34**	0.39***	0.49***	0.50***	0.36***	1.00	0.59		

FCRI-S, Fear of Cancer Recurrence Inventory-Severity; SD, standard deviation.  
\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .



**Figure 1.** Initial confirmatory factor analysis model. FCR, fear of cancer recurrence.



**Figure 2.** Revised confirmatory factor analysis model. FCR, fear of cancer recurrence. \*\*\* $p < 0.001$ .

**Table 3.** Correlations of the FCRI-S subscale with FCR-related measures and other psychosocial measures

Variables	Range of score	Mean ± SD	Correlation coefficient with FCRI-S
FCRI-S	0-4	2.11 ± 0.84	-
CWS	1-4	2.07 ± 0.64	0.80***
FoP-Q-SF	1-5	3.06 ± 0.91	0.69***
PHQ-9	0-3	0.68 ± 0.67	0.37***
MOS-SSS	1-5	3.74 ± 0.94	-0.23*

FCRI-S, Fear of Cancer Recurrence Inventory-Severity; FCR, fear of cancer recurrence; CWS, Cancer Worry Scale; FoP-Q-SF, short form of the Fear of Progression Questionnaire; PHQ-9, Patient Health Questionnaire-9; MOS-SSS, Medical Outcomes Study-Social Support Survey; SD, standard deviation.  
\* $p < 0.05$ , \*\*\* $p < 0.001$ .

## DISCUSSION

The present research examined the psychometric characteristics of the FCRI-S subscale in Korean cancer survivors and its applicability to this group. The overall results indicate that the FCRI-S subscale has good internal consistency and construct validity (one-factor structure, convergent validity, and discriminant validity) among Korean cancer survivors and that the instrument can be utilized effectively to screen and evaluate FCR levels in clinical settings.

Regarding the item analysis, the corrected item-total correlations ranged from 0.40 to 0.72. Ferketich [28] suggested that



for a good scale, these correlations should fall between 0.30 and 0.70. Therefore, this study demonstrates that the FCRI-S subscale is suitable for assessing FCR severity among Korean cancer survivors. In addition, this study found slightly higher corrected item-total correlations for the FCRI-S subscale than those reported in previous studies involving French-speaking, English-speaking, and Korean-speaking populations [7,9,10].

Second, the Cronbach's  $\alpha$  and CR were 0.88 and 0.89, respectively, indicating an acceptable level of internal consistency for the FCRI-S subscale. These estimates were similar to those obtained from studies using the French, English, and Italian versions [7,9,29]. Interestingly, the reliability coefficients of this study exceeded those reported in previous Korean studies [10,30]. These findings confirmed the satisfactory internal consistency of the FCRI-S subscale.

Third, the FCRI-S subscale model, which includes 2 correlated errors (F2 and F6; F7 and F8), demonstrated a good fit with a one-factor structure. These findings align with previous studies that conducted a CFA of the FCRI-S subscale, where model fit was enhanced by incorporating indicators with correlated errors [9,10]. Specifically, Shin et al. [10] observed the same correlation between errors F7 and F8 on the FCRI-S subscale as this study, while Lebel et al. [9] identified a correlated error between F3 and F6 in the severity subscale. The variation in correlated error parameters suggests the potential for redundant items in the FCRI-S subscale and cultural differences between Asian and Western populations [10]. Regarding the factor structure of the FCRI-S subscale, the results indicated a medium to high range of factor loadings (0.38-0.85), consistent with previous research [7,9]. Further studies are needed to cross-validate and replicate the FCRI-S subscale factor structure.

Fourth, this study confirmed both the convergent and discriminant validity of the FCRI-S subscale. The FCRI-S subscale demonstrated strong correlations with other FCR-related measures, such as the CWS and the FoP-W-SF, thereby confirming its convergent validity. Conversely, the FCRI-S subscale showed relatively weak correlations with the PHQ-9 and the MOS-SSS, which supports its discriminant validity. These findings are consistent with previous research on cancer survivorship in Australia, Italy, and Korea [10,29,31]. However, an empirical study [31] indicated that despite their significant correlations, the FCRI-S subscale and the FoP-W-SF represent different constructs and are linked to different risk factors. Further research is recommended to explore the similarities and differences among FCR-related instruments, with careful selection of an

FCR measure tailored to the characteristics of the study participants.

This research has several limitations. The use of a non-probability sampling approach may restrict the generalizability of the findings to a broader population of Korean cancer survivors. Future studies should adopt a more systematic sampling strategy to enhance both generalizability and representativeness. Additionally, since the present study mainly included female with breast cancer, additional research is needed to explore the experiences of male cancer patients with other cancer types. Another limitation is the insufficient sample size, which precluded the performance of CFA. Future studies should include a larger sample size to thoroughly investigate the psychometric properties of the FCRI-S subscale.

The present research represents the initial examination of the psychometric characteristics of the FCRI-S subscale in the context of Korean cancer survivors. The findings support the use of the FCRI-S subscale for rapidly measuring the extent of FCR among cancer survivors in clinical settings. This study also suggests that the ways in which Korean cancer survivors experience FCR may differ from those of cancer survivors in other countries. Information on the psychometric properties of the FCRI-S subscale can assist healthcare professionals in integrating the concept of FCR into their health promotion activities and interventions. Additionally, the FCRI-S subscale can be useful for healthcare practitioners and researchers to efficiently measure FCR symptoms in cancer survivors when indicated and to implement clinical interventions to reduce FCR. A recent study [32] even suggested using a single-item FCR measure in clinical and research settings, thereby reducing the administrative burden of the screening process. It is also important to evaluate the changes in FCR symptoms among cancer survivors over time. More longitudinal studies are recommended to determine how long-term FCR can affect cancer survivors' daily lives and quality of life. Furthermore, considering that FCR research in Korea is relatively nascent, qualitative research or mixed methods research can be helpful for exploring the lived experiences of cancer survivors regarding FCR [33]. Finally, the present study suggests that the Korean government should consider including FCR measurements in Korea's National Cancer Control Plan (NCCP). The NCCP has been implemented to establish a national cancer control system and to improve cancer treatment and prevention [34]. Routine assessment of FCR can be an effective and efficient strategy for developing comprehensive interventions for cancer survivors

and promoting cancer control policies in Korea.

In conclusion, most cancer survivors experience a range of psychological difficulties, including fear, anxiety, depression, and sadness. As cancer survival rates increase, FCR has emerged as a significant and common concern among survivors [5]. Considering the limited research on the psychometric validity of the FCRI-S subscale in Korea, this study equips healthcare professionals with valuable insights into the internal consistency and validity of the FCRI-S subscale for Korean cancer survivors. Active screening using valid and reliable measures such as the FCRI-S subscale is crucial for early detection and clinical interventions for FCR. This approach contributes to effectively reducing FCR and managing cancer control plans at the national level.

## NOTES

### Conflict of Interest

The author has no conflicts of interest associated with the material presented in this paper.

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### Author Contributions

All work was done by SYP.

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