



## Development and psychometric testing of a personal health-related resources instrument for working-age women with breast cancer

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### ABSTRACT

**Background:** Personal health-related resources are essential for women with breast cancer, as these help them to maintain their own health and well-being during cancer care. Nurses play an important role in providing support to identify personal health-related resources of women during cancer treatments.

**Purpose:** To develop and test the psychometric properties of a new self-assessment personal health-related resources (PHRR) instrument for working-age women receiving breast cancer care.

**Methods:** A four-phase instrument development process was used. The data were analysed using the content validity index, content validity ratio and exploratory factor analysis. Reliability was tested using Cronbach's  $\alpha$  coefficients.

**Results:** The instrument's content validity index was 0.93. Exploratory factor analysis showed that the instrument version 3.0 comprised three main factors, 12 sub-factors and 46 items, which explained 67.4 % of the total variance in the measured variable. The instrument's internal consistency was high, with Cronbach's  $\alpha$  of 0.92.

**Conclusion:** The instrument showed acceptable psychometric properties and was suitable for measuring PHRR in women aged 18–65 years with breast cancer. The instrument provides multidimensional understanding of the PHRR of women with breast cancer. The PHRR instrument can be used to achieve a comprehensive understanding of the personal health-related resources for women with breast cancer during cancer care. This instrument can provide information how to support women and development psychosocial support in different phases of illness.

### Introduction

Breast cancer is the world's most prevalent cancer and the most common cancer in women. In 2020, there were 2.26 million cases diagnosed worldwide and, by the end of that year, there were 7.8 million women alive who had been diagnosed with breast cancer in the past five years (Ferlay et al., 2021). Working age women, aged 15–64 years, account for the largest number of breast cancer cases (OECD/European Commission, 2025). The World Health Organization (WHO) had previously reported that more than half of the women with breast cancer were of working age, which is widely considered to be 18–65 years of age (Ferlay et al., 2018). Younger women with breast cancer frequently experience side effects and late effects of treatment. These often include

pain, peripheral neuropathy, fatigue, cognitive impairment, anxiety and depression, which negatively affect their overall health, functioning, quality of life and daily life (Boelhouwer et al., 2021; Rosenberg et al., 2022).

Personal health-related resources (PHRR) is a multidimensional concept. It comprises individual subjective experiences and perceptions of qualities, strengths or strategies. The concept of PHRR includes individual internal factors, such as attitudes to life, abilities, behaviour and deeds, and external factors such as social support from other people and different communities (Antonovsky, 1979; Coughlin, 2008; Antonovsky, 1987; Hobfoll, 1989; Malterud and Hollnagel, 1997; Hollnagel, 1998).

Women with breast cancer have different PHRR and different

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abilities to use their own health-related resources to coping in everyday life with breast cancer. Women usually need, and use, several different PHRR at the same time to maintain and promote health, functioning and quality of life. In addition, these resources play a crucial role in overcoming stressors, so that they can resolve the physical and mental health and social problems related to their cancer (Antonovsky, 1979; Pinquart and Frohlich, 2009). They have also been reported to associate with health outcomes (Saares and Suominen, 2005; Speller et al., 2019) and women's ability to work and return to work when they have breast cancer (Sun et al., 2017; Butow et al., 2020; Porro et al., 2022). It is important to identify and measure personal health-related resources as comprehensively as possible during cancer treatments, because of women with breast cancer can find it challenging to focus on, and use, their own PHRR (Coughlin, 2008; Doege et al., 2019). In addition, measuring patients' perceptions of their PHRR helps healthcare providers to plan individual comprehensive care and psychosocial support for women with breast cancer (Di Maio et al., 2022; Skyttä et al., 2023).

Validated questionnaires are the most common quantitative methods that are used to measure patients' perspectives of health outcomes (Di Maio et al., 2022; Crow et al., 2002; Minvielle et al., 2023). A systematic review (Skyttä et al., 2023) identified 25 instruments to describe and assess various personal health-related resources for women with breast cancer. However, all instruments were specific in their nature to measure single personal health-related resource. Instead, a generic instrument covering all aspects of personal health-related resources were not found. All identified instruments are psychometrically sound and focus on aspects such as social support, spirituality, optimism, hope, self-esteem or self-efficacy (Doege et al., 2019; Skyttä et al., 2023; Wallace et al., 2021; Chiesi et al., 2022). There are available several validated instrument for these specific resources. This means that it was not possible for us to achieve a large-scale understanding of the individual health-related resources for women with breast cancer. To fill the knowledge gap, there is a need to develop a new instrument to assess comprehensively personal health-related resources of women with breast cancer. This would enable to comprehensively identify the woman's PHRR and provide them with the individual support they need as part of personal-centred cancer care (Skyttä et al., 2023; Hughes et al., 2021; De Ligt et al., 2023).

## Aim

The aim of this study was to develop a new self-assessment instrument to measure the PHRR of working-age women receiving breast cancer care. The study also aimed to test the content validity, feasibility,

construct validity and reliability of the instrument. The research questions were:

1. What were the content validity and feasibility of the PHRR instrument?
2. What was the construct validity of the PHRR instrument?
3. How reliable was the PHRR instrument?

The ultimate goal of the developed self-assessment instrument was to assess various perspectives of PHRR. This information could then be used to help health care professionals plan individual psychosocial support for women with breast cancer.

## Methods

This was an instrument development study and the method was based on DeVellis and Thorpe (2021). The four-phase design comprised: 1) identifying and defining the content of the instrument, 2) operationalizing, converting the content into measurable items, formulating a blueprint and evaluating the content validity, 3) testing the feasibility of the instrument 4) evaluate the psychometric properties of the instrument, namely the construct validity and reliability (Table 1).

The first phase an integrative review (Skyttä et al., 2023) was conducted to identify and define the content of the PHRR. This used search terms like resources, breast and synonyms for those words. A total of 23 papers were included in the review. The data were analysed using inductive content analysis (Graneheim and Lundman, 2004). The PHRR of the women with breast cancer were identified and these comprised three different main domains (*Personal strengths, Social support from and involvement in their cultural community and Person-centred cancer care*) and nine sub-domains (*Positive thinking and attitude, Personal skills and abilities, Spirituality/philosophy about life, Balanced daily living, Social support during life changes, Involvement in their cultural community, Trusted the cancer care provided, Involvement in own care, Confidential collaborative relationships with healthcare professionals*) (Table 2).

The second phase was to operationalize items based on integrative review and formulate the blueprint of the first version of the instrument (version 1.0). Based on inductive content analysis were identified main (three) and sub-domains (nine) and specific internal and external 46 personal health-related resources (Skyttä et al., 2023). The resources were operationalized into measurable items, and the content validity of the instrument was evaluated by experts panel.

The ultimate aim of the PHRR instrument was to identify and assess the external and internal individual PHRR of women with breast cancer.

**Table 1**

Development phases of the PHRR instrument.

### Phase I. Identifying the content of the PHRR

**Aim.** To identify and define content of the PHRR instrument

**Method.** Integrative review method

**Sample.** 23 papers covering 1346 women, with mean ages from 21 to 60 years

**Analysis.** Inductive content analysis

**Publication.** Blinded for review

### Phase II. Operationalizing items and evaluating a content validity

**Aim.** Operationalizing the content into measurable items in PHRR instrument (version 1.0), to formulate the blueprint and evaluate the content validity

**Method.** Expert panel

**Sample.** 16 experts

**Analysis.** Content validity index (CVI) and content validity ratio (CVR)

### Phase III. Feasibility test

**Aim.** To test feasibility of the PHRR instrument version 2.0.

**Method.** Paper survey

**Sample.** 29 women aged 18–65 years with breast cancer

**Analysis.** Content analysis and descriptive statistics

### Phase IV. Testing the psychometric properties

**Aim.** To evaluate the psychometric properties, namely the construct validity and reliability, of the PHRR instrument version 3.0.

**Method.** Cross-sectional study design

**Sample.** 208 women aged 18–65 years with breast cancer

**Analysis.** Exploratory factor analysis and internal consistency reliability

**Table 2**

Content of the personal health-related resources of working-age women with breast cancer based on the integrative review (Skyttä et al. 2023).

Main domains	Sub-domains
Personal strengths	Positive thinking and attitude
	Personal skills and abilities
	Spirituality/philosophy about life
Social support from and involvement in their cultural community	Balanced daily living
	Social support during life changes
	Involvement in their cultural community
Person-centred cancer care	Trusted the cancer care provided
	Involvement in own care
	Confidential collaborative relationships with healthcare professionals

The instrument was evaluated from two different perspectives of content, namely realization and importance. A four-point Likert type scale was used to evaluate the PHRR: the score ranged from one, for never fulfils or not at all important, to four for always fulfils or extremely important.

The content validity of the PHRR instrument version 1.0 was evaluated using an expert panel (Polit et al., 2007). We emailed 20 experts, oncologists, cancer nurses and other health care professionals, to take part in the expert panel. They provided experience of breast cancer care and the instrument development process. Of these, 16 agreed to take part anonymously. The experts evaluated how well identified the items covered and defined the PHRR of women aged 18–65 years with breast cancer and how well they had been converted into measurable items. Five-point Likert scales, that covered ranges such as very well to not at all, were used. In addition, the experts evaluated each item from four different points of view: clarity, relevance, concreteness and importance. Items were evaluated using a four-point scale that ranged from one for not at all to four for very well. The experts had the opportunity to provide written comments and suggestions on missing content or items related to the PHRR of women with breast cancer.

To test the agreement between experts, we used the content validity index (I-CVI) and the scale content validity index (S-CVI) to assess the content validity and values of the of the PHRR instrument items. A four-point scale, for example ranging from one for not relevant to four for highly relevant, was used to compute the content validity index for the items (I-CVI) in the instrument. Each I-CVI was calculated based on the number of experts scoring either three or four. The I-CVI recommendation is that the value should be over 0.78 in cases where six or more judges are involved. The S-CVI was calculated to test the inter-raters' agreements and this was defined as the proportion of items in an instrument that achieved a rating of three or four by all the content experts. An S-CVI value of 0.80 or higher is recommended (Lawshe, 1975; Lynn, 1986; Polit and Beck, 2006). Version 2.0 of the PHRR instrument items was modified based on the expert panel.

After evaluating of the content validity, the feasibility of the PHRR instrument version 2.0 was tested by 29 working-age women aged 18–65 years with breast cancer. Women who were currently receiving breast cancer treatment, and survivors who had finished their treatment, were invited. Participants were provided with information about the study and recruited by the national breast cancer association's social media channels, namely Facebook, Instagram and LinkedIn. Those who contacted the researcher (M.Sk) were sent information about the feasibility test, the PHRR instrument version 2.0 questionnaire and a return envelope. They evaluated four elements of the PHRR instrument: the items, the questionnaire, the instructions and how it was filled in. The women provided written comments related to the clarity of the content and items, how specific the items were, whether appropriate language was used, the emphasis on certain factors and the simplicity, brevity and relevance. The data were analysed using inductive content analysis and the items were formulated based on that analysis (Graneheim and Lundman, 2004).

In this study psychometric properties, construct validity and reliability were evaluated using a cross-sectional study design. Following recommended scale development practices (DeVellis and Thorpe, 2021), an exploratory factor analysis (EFA) is applied to identify correlations among observable variables to aid in the data reduction of variables related to each dimension (i.e., factor) of the construct (Williams et al., 2012). To achieve sufficient sample size, 200–300 participants were needed (DeVellis and Thorpe, 2021). The appropriateness of EFA was examined by coding the presence or absence of Bartlett's test of sphericity and The Kaiser-Meyer-Olkin (KMO). The scale item selection criteria categories included coding the presence and absence of minimal significant loadings, cross loadings (i.e., significant loadings on two or more factors) and item number per factor (e.g., minimum of 3 items per factor). The instrument's reliability evaluated using Cronbach's  $\alpha$  coefficient (DeVellis and Thorpe, 2021; Norris and Lecavalier, 2010).

#### Data collection

During phase four, the two university hospitals recruited working-age women aged 18 – 65 years with breast cancer to participate to the study. A researcher (M.Sk), and the unit's nurses, recruited the participants who met the selection criteria during chemotherapy or radiotherapy sessions. The women needed to be 18 – 65 years of age, were currently receiving their treatment for breast cancer in the chemotherapy and radiation therapy ward and had received their diagnosis in the last eight months. They also needed to be able to complete the questionnaire in Finnish. Exclusion criteria were that breast cancer was not relapsed and women were unable to make decisions for herself. The data for the cross-sectional study were collected from November 2022 to September 2023. To achieve a sufficient sample size, the participants were also recruited from the social media channels of the national cancer association.

#### Data analysis

In phase four, the data were analysed using the SAS Enterprise Guide 8.3 software 2020 (SAS Institute Inc., Cary, NC, USA). The participants' characteristics are presented using descriptive statistics: numbers, percentages, means and standard deviations. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were used to determine whether the data were suitable for exploratory factor analysis (Watson and Thompson, 2006; Williams et al., 2012). Exploratory factor analysis was suitable method because the content of the instrument was based on previous empirical studies and the construct of the instrument was evaluated at the first time. The data were examined for construct validity by undertaking factor analysis with the principal component factor extraction method and varimax rotation, which is an orthogonal rotation where the independence of the factors is preserved. The explanation rate of the total variance of items was  $> 0.40$  and the number of factors was comprehensively determined by reviewing the eigenvalue for values of at least 1.0 (Costello and Osborne, 2005). The instrument's reliability evaluated using Cronbach's  $\alpha$  coefficient. It was verified based on criterion of (Hinkin, 1998), where a Cronbach's  $\alpha$  coefficient 0.70 or higher indicates good reliability (Ferketich, 1991; DeVellis and Thorpe, 2021).

#### Ethical considerations

The study was conducted following the guidelines of the Finnish National Advisory Board (TENK, 2023) and European Federation of Academies of Sciences and Humanities (ALLEA, 2023). Approval was received from the ethics committee of the University of Turku and research permission was granted by the university hospitals and cancer society. All study participants were informed about the purpose of the voluntary study, the fact that it was anonymous, their rights as study participants and the data protection requirements. The researcher (M.

Sk) met some of the women in the hospital, but their questionnaires remained anonymous. The participants had the opportunity to contact the researcher and get oral information about the research and their personal data protection. They provided their written, informed consent to be included in the study by completing the questionnaire.

## Results

### Content validity

The S-CVI of all the instrument items was 0.93 (range 0.50–1.0). The 16 experts found that 38 out of the 45 PHRR items had an I-CVI or more than 0.78 (range 0.17–1.0), based on a rating of three or four, meaning that they were quite relevant or highly relevant.

The panel stated that the PHRR instrument covered comprehensive aspects of women with breast cancer. The ‘Problem solving’ item in the main ‘Personal strengths’ domain was deleted due to its low I-CVI score (0.23). Half of the experts said that the item wasn’t relevant, clear or important. The experts also concluded that three items related to spirituality were irrelevant, as they only had rating of one or two (range 0.17–0.69). However, these items remained unchanged in version 2.0, based on the theoretical content of PHRR.

Based on the experts’ written comments, we added two new items to the sub-domain on balanced daily life and these were about experiences of overall health and of functioning. The sub-domain on involvement in own care was deleted and the items were incorporated into the sub-domains on trusted cancer care and confidential collaborative relationships with health care professionals. A number of main domains were clarified or simplified by making minor changes to the wording, based on the written comments provided by the experts and discussions in the research group. These were ‘Personal strengths’, ‘Social support from and involvement in their cultural community’ and ‘Person-centred care’. PHRR Version 1.0 was modified based on the expert analysis and version 2.0 comprised the same three main domains and eight rather than nine sub-domains, as one was deleted. There were 46 items in the second version, as one item was deleted and two new items were formulated.

### Feasibility testing

The feasibility of version 2.0 was tested by 29 working-age women with breast cancer. They analysed the content of the PHRR instruments, in terms of its format, instructions and usability and concluded that it worked and was appropriate. The women said that the instrument was feasible and easy to complete. Their feedback resulted in changes to four items in the main domains of ‘Personal strength and social support and cultural community involvement’. These were clarified or simplified by making minor changes to the wording. Version 3.0 was modified based on the feasibility testing.

As Personal Health-Related Resources (PHRR) version 3.0 was ultimately composed of the following three main domains (*Personal strengths, Social support from and involvement in their cultural community and Person-centred cancer care*) and twelve sub-domains (*Positive thinking and attitude, Self-knowledge, Knowledge about cancer and care, Skills and abilities, Spirituality/philosophy of life, Balanced daily living, Close relationships, Work community, Peer support, Participate to cultural community, Confidential collaboration with health care professional and Involvement own care*). Based on main and sub-domains, 46 items were generated.

### Psychometric properties test

The psychometric properties, construct validity and reliability of version 3.0 were tested using a cross-sectional study design.

A total of 208 working age women with breast cancer, who were receiving chemotherapy or radiotherapy treatment participated in the

study. They were also asked background questions about their age, education level, employment status, cancer status, current treatment, relationship status and whether they cared for others. The participants’ mean age was  $52.5 \pm 8.6$  years. The majority (52 %) were receiving chemotherapy for their breast cancer, 42 % were having radiotherapy and 6 % received their last chemotherapy or radiotherapy treatment when they took part in the study. Most of the participant had localized breast cancer (88 %) and they had received different personalized cancer treatments for their breast cancer. The participants had range of education levels and more than half (69 %) worked (Table 3).

### Construct validity

Kaiser-Meyer-Olkin (KMO) and Bartlett’s sphericity tests were conducted before the exploratory principal-component factor analysis (PCA) was conducted. The results of both of these tests were statically significant and indicated that the data were suitable for factor analysis. The KMO was 0.85 and the Bartlett’s sphericity test results were: chi-square 4572 and degrees of freedom 1035, ( $p < 0.001$ ).

Exploratory principal-component factor analysis (PCA) with varimax and orthogonal rotation were conducted. Using an eigenvalue cut-off point of 1.0, the 46 items in version 3.0 loaded a total of 12 factors, which explained a cumulative 67.3 % of the total variance. This result satisfied the criterion for the explanatory power of the instrument, as it was more than 50–60 % (Hair et al., 2010). Based on the PCA results, some of the 26 items in the ‘Personal strengths’ main domain were grouped in a different way in version 3.0. For example, there were six primary factors in version 3.0 instead of four (Table 4).

The item ability to discuss with other people was moved from the ‘Personal strengths’ to ‘Social support from and involvement in their cultural community’ main domain, which then consisted of 11 items. In addition, the 11 items in the main domain ‘Social support from and involvement in their cultural community’ were grouped in different ways in version 3.0, based on the EFA. Four primary items were grouped into two factors (Table 4).

All the items in version 3.0 had a loading value of more than 0.40 and none of them were deleted after the EFA. The 25 items in the main domain ‘Personal strengths’ ranged from 0.40 to 0.87 and the 11 items in the main domain ‘Social support from and involvement in their cultural community’ ranged from 0.54 to 0.83. The 10 items in the main domain ‘Person-centred cancer care’ ranged from 0.44 to 0.84. The EFA showed that version 3.0 had good construct validity. After the EFA, the

**Table 3**  
Characteristics of the 208 participants.

Variable	n	%
<b>Age in years mean, SD</b>		52.5, SD 8.6 years Range 32– 65 years
<b>Educational level</b>		
Masters’ degree	73	35.1
Bachelors’ degree	39	18.8
Post-secondary school	49	23.6
Secondary school	39	18.8
Primary school	7	3.4
Other	1	0.3
<b>Employment status</b>		
Employed	169	81.3
Unemployed	12	5.8
Retired	14	6.7
Other	13	6.2
<b>Cancer status</b>		
Localized breast cancer	183	88.0
Regional or distant cancer	16	7.7
Cannot say	9	4.3
<b>Current treatment</b>		
Chemotherapy	108	51.9
Radiotherapy	87	41.8
Other treatments	13	6.3

**Table 4**  
Factor, eigenvalue and 46 abbreviated items loading of the PHRR instrument version 3.0.

Factor (Eigenvalue)	Abbreviated items	Loading	
<b>1. Personal strengths</b>			
	A positive attitude towards life	0.74	
	Meaning of life	0.41	
<b>Factor 1. Positive thinking and coping (11.1)</b>	Desire to do meaningful things in life	0.64	
	Resilience	0.65	
<b>Factor 2. Satisfaction with oneself (3.3)</b>	Ability to see the positive side of things	0.62	
	Ability to make decisions	0.42	
	Self-esteem	0.59	
	Positive identity	0.73	
<b>Factor 3. Disease-specific knowledge (3.1)</b>	Body confidence	0.40	
	Knowledge about disease	0.71	
	Knowledge about treatment options	0.77	
<b>Factor 4. Self-care (2.6)</b>	Ability to search for information related to cancer	0.75	
	Motivation to self-care	0.52	
	Means to care for oneself	0.77	
<b>Factor 5. Spirituality (2.1)</b>	Ability to solve problems	0.46	
	Spirituality	0.87	
	Religion or worldview	0.79	
	Spiritual practices	0.86	
<b>Factor 6. Means to promote health and functioning (1.5)</b>	Means to promote own well-being	0.60	
	Positive experience of health	0.68	
	Positive experiences of functioning	0.77	
	Healthy lifestyle habits	0.47	
	Performing meaningful daily activities	0.62	
	Positive experiences of work ability	0.59	
<b>2. Social support and cultural community involvement</b>	Subsistence	0.52	
	Support from other close relationships	0.54	
<b>Factor 7. Interpersonal relationships (1.5)</b>	Support from spouse or life partner	0.65	
	Support from work community	0.79	
<b>Factor 8. Work community (1.4)</b>	Support from manager/teacher/trainer	0.83	
	Support from peers	0.64	
<b>Factor 9. Cancer peers (1.8)</b>	Ability to discuss with other people	0.76	
	Belonging to meaningful communities	0.76	
	Involvement in communities	0.77	
<b>Factor 10. Community membership (1.1)</b>	Support from communities	0.76	
	Supportive cultural roles in communities	0.62	
	Supportive norms and activities in communities	0.76	
	Confidence in cancer care	0.46	
<b>3. Person-centred cancer care</b>	Open and honest communication with professionals	0.44	
	Emotional support from professionals	0.74	
	<b>Factor 11. Supportive care (1.1)</b>	Feeling safe during care	0.65
		Feeling heard and encountered	0.84
	Care responds to individual support needs	0.83	
	Receiving individual counselling	0.81	
	Plan took wishes and expectations into consideration	0.71	
	<b>Factor 12. Collaboration with professionals (1.0)</b>	Culturally sensitive information from professionals	0.46
		Shared decision-making with professionals	0.81

PHRR instrument had three main domains, 12 sub-domains and 46 items (Table 4).

*Reliability*

The instrument had high internal consistency, with Cronbach’s  $\alpha$  of 0.92. The three main factors ranged from 0.84 to 0.88. The sub-factors of ‘Personal strengths’ ranged from 0.60 to 0.84, ‘Social support from and involvement in their cultural community’ ranged from 0.31 to 0.84 and ‘Person-centred cancer care’ ranged from 0.74 to 0.87 (Table 5).

**Discussion**

This study focused on the development and testing of a new self-assessment PHRR instrument for working-age women receiving breast cancer care. Following the systematic instrument development process, the final PHRR instrument (version 3.0) consisted of 3 main domains, 12 sub-domains and 46 items. The results indicated that the PHRR instrument was stable over time and capable of measuring the PHRR of women during breast cancer treatments.

The new developed instrument assess comprehensively personal health-related resources of women with breast cancer. It is significant that resource-oriented perspectives have been receiving more attention in recent years. This is because resources have been reported to be associated with better health-related quality of life and the ability to cope with cancer (Finck et al., 2018). Resource orientation is part of health promotion and it plays an important role in supporting women living their everyday lives with breast cancer. It is necessary to consider, and evaluate, how we can use women’s own personal resources to provide integrated attention their overall health, well-being and quality of life during breast cancer (Montañés-Muro et al., 2023; Prüfer et al., 2013).

Personal health-resources are significant factors in coping process. One of the most commonly-used measures of coping for health-related conditions is the Brief COPE scale. The Brief-COPE is a 28 item self-report questionnaire designed to measure effective and ineffective ways to cope with a stressful life event such as cancer (Carver, 1997). For breast cancer the best model of the Brief COPE was the original 14-factor version. In clinical practice, assessing coping at the appropriate level of detail can help health professionals discern which resources and strategies are situationally appropriate (Rand et al., 2019).

In addition a Sense of Coherence Scale-3 (SOC-3), A Brief Resilience Scale (BRS), A Life Orientation Test (LOT-R) were used to measure three different resource variables of women with breast cancer. These resource variables are relevant for understanding the situation of cancer patients. Professionals who notice low levels of sense of coherence,

**Table 5**  
Reliability of the PHRR instrument version 3.0.

Main domains	Cronbach’s $\alpha$
<b>1. Personal strengths (25 items)</b>	
Positive thinking and attitude	0.88
Self-knowledge	0.79
Knowledge about cancer and care	0.68
Skills and abilities	0.80
Spirituality/philosophy of life	0.60
Balanced daily living	0.84
<b>2. Social support from and involvement in their cultural community (11 items)</b>	
Close relationships	0.84
Work community	0.49
Peer support	0.87
Participate to cultural community	0.31
<b>3. Person-centred cancer care (10 items)</b>	
Confidential collaboration with health care professional	0.83
Involvement own care	0.88
All items	0.87
	0.74
	0.92

resilience, or optimism in their cancer patients will be better prepared for identifying patients in need for individual support. Especially younger patients deserve special attention. Using these generic instruments makes it possible to compare the results of the cancer patients with other patients and with groups of the general population. (Hinz et al., 2023). These instrument ultimate goal is different than PHRR instrument, but instruments include in the similar content related to personal health-related resources.

In order to be active in own life and opportunity to participate own health promotion, women with breast cancer need comprehensive psychosocial support to identify own resources for health care professionals. A biomedical care for breast cancer has been developed rapidly, it is important to develop quality of life through personalized psychosocial support (Meoded et al., 2025). Identifying personal health-related resources and offer psychosocial support to increase women's functioning, work ability and promote their return to work after breast cancer (Rosenberg et al., 2022; Magnavita et al., 2023). This is also necessary for socio-politically reason, because of population rapidly aging in many EU countries and number of working-age population is decreasing (Eurostat, 2025).

The newly developed PHRR instrument showed preliminary acceptable validity and reliability. However, it also included a few weak items related to decision-making, personal skills, the meaning of life and having a healthy body image. These items had an EFA loading value of approximately 0.40. In addition, the EFA identified new factor related to support from the work environment. Decades of research have shown that tailored support is important for women with breast cancer who are returning to working life or working during their cancer treatment. These include support from colleagues and having their work customised to their health (Rosenberg et al., 2022; Tiedtke et al., 2010; Bilo-deau et al., 2024). In the future we may need to evaluate and modify the item related to health-related resources in the work environment. In addition, the weak items in version 3.0 need further validity testing to identify any modifications that are needed. The instrument version 3.0 is primarily targeted for research purpose. Instrument's form and layout is needed to modify to implement instrument in clinical practice.

### Limitations

Overall, the instrument development followed a systematic four-phase process, but there are still some limitations that need to be considered when interpreting the results.

First the sample size is small, but a representative group of working-age women with breast cancer (Seppä et al., 2025). Broader testing across diverse settings would enhance generalizability at the future.

Second, the sample size in the cross-sectional study was 208 working age women with breast cancer, which is lower than the recommended size of 300 (Hinkin, 1998; DeVellis and Thorpe, 2021). However, the KMO measure of sampling adequacy and Bartlett's test of sphericity indicated that the data were suitable for the EFA.

Third, the instrument was developed and tested in Finnish, despite the increase in Finland's multicultural population in recent decades. The study participants were mostly native Finnish speaking people. The cross-cultural validity of the instrument could benefit from being tested by multicultural participants and in different countries, social structures and cultural settings, particularly in community-based cultures. In future it could be beneficial to evaluate criterion validity to ensure practical relevance and also support predictive validity of the newly developed instrument. Health-related quality of life instruments are designed to measure cancer patients' physical, psychological and social functions. Many of quality of life instruments include in questions related to personal health-related resources. The instrument can be applied to use evaluate criterion validity. (Heidary et al., 2023).

Fourth, recruitment via social media able to associate with selection bias such as ensure diversity in socioeconomic status, ethnicity, or geographic location. Using social media to recruit research participants

is established in nursing and health research. (Kleib and Olson, 2022 Aug 4).

Fifth, the EFA indicated that the instrument included a few weak items, which had a loading of just under 0.40. The validity of the instrument could be improved in the future by modifying the content, language or expressions of the weak items or by deleting them (DeVellis and Thorpe, 2021).

Sixth, the criterion validity could be evaluated in the future if suitable instruments are identified that help to achieve comprehensive understanding about the validity of the new instrument. This study did not evaluate this criterion, because previous instruments did not measure comprehensive aspects of the PHRR of women with breast cancer.

### Conclusions

This newly developed 46 item instrument showed preliminary acceptable psychometric properties and it seems to be suitable for measuring PHRR in working aged women with breast cancer. Bringing together resources in one instrument can improve how we identify individual resources that promote the health of women with breast cancer, as well as their ability to cope and experience quality of life. The health-related resources of women with breast cancer are comprehensive and women usually use several resources at the same time. The instrument can be used to achieve a comprehensive understanding of the PHRR that women need during breast cancer care. This instrument used in this study can provide information on how to support women with breast cancer and develop psychosocial support in person-centred cancer care.

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### CRediT authorship contribution statement

**Marika Skyttä:** Writing – original draft. **Lauri Sillanmäki:** Data curation. **Minna Stolt:** Supervision. **Mari Kangasniemi:** Supervision.

### Declaration of Competing Interest

None declared.

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