

# Psychosocial Risk Scale (PRS) for Breast Cancer in Patients with Breast Disease: A Prospective Case-Control Study in Kuopio, Finland

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**Abstract.** *Background:* In 1982, Wirsching *et al.* introduced a psychosocial risk scale (PRS) for psychological identification of breast cancer patients before biopsy. To our knowledge, the associations between PRS and risk of breast cancer are rarely considered together in a prospective study. *Patients and Methods:* This study is an extension of the Kuopio Breast Cancer Study. Women with breast symptoms were referred by physicians to the Kuopio University Hospital (Finland) and were asked to participate in this study. These women ( $n=115$ ) were interviewed, and all study variables were obtained before any diagnostic procedures were carried out, so neither the investigator nor the participants knew the final diagnosis of breast symptoms at the time of the interview. The research method used was the semistructured in-depth interview method. The investigator used the Montgomery-Åsberg depression rating scale (MADRS) to evaluate the depression of the study participants. All participants were also asked to complete standardized questionnaires (Beck depression inventory and Spielberger trait inventory). The investigator estimated the PRS using a 3-point scale: grade I, low psychosocial risk; grade II, mild/moderate psychosocial risk; grade III, high psychosocial risk for breast cancer. *Results:* The clinical examination and biopsy showed breast cancer in 34 patients, benign breast disease in 53 patients, and 28 individuals were shown to be healthy (HSS). The results indicated that breast cancer patients used more idealization of childhood, and motherhood ( $p=0.04$ ) than did the other groups. PRS was significantly associated with increased breast cancer risk ( $p=0.05$ ). *Conclusion:* The results of this study support a moderate association between Wirsching *et al.*'s PRS score

and breast cancer risk. However, the biological explanation for such an association is unclear and the exact effects of psychological factors on the various hormones relevant to development of breast cancer are at present poorly defined.

Breast cancer is the most important female cancer in industrialized countries, and its incidence has shown a consistent increase in recent decades. The lifetime risk of breast cancer for a girl born today is double that of one born 50 years ago. Hormonal factors such as early age at menarche, later age at menopause, later age at first full-term pregnancy and hormone replacement therapy are known to be the main risk factors for sporadic breast cancer (1). In addition, life-style factors, such as obesity, smoking, alcohol consumption and lack of physical activity, appear to contribute to the increased risk for this malignancy, although the results concerning these life-style factors are inconsistent (1-7). Psychological factors, such as stressful and adverse life events, are widely thought to play a role in the etiology of breast cancer (8-13). Many case-control studies have also investigated the relationship between anxiety, depression, the history of psychiatric symptoms and the risk of breast cancer in relation to suppression of emotions and anger in particular (14-21). We have prospectively investigated breast cancer risk in relation to anxiety, coping and defending, depression, idealization, the history of psychiatric symptoms and stressful and adverse life experiences among patients with breast disease in the Kuopio Breast Cancer Study (22-25). The results of our study support an overall association between stressful life events, coping and defending, and breast cancer risk.

In 1982, Wirsching *et al.* introduced a psychosocial risk scale (PRS) for psychological identification of breast cancer patients before biopsy (15, 26). To our knowledge, the association between Wirsching *et al.*'s psychosocial risk scale (PRS) and risk of breast cancer is rarely considered together, and therefore we carried out a prospective study to examine the role of PRS in women with breast symptoms referred by physicians to the Kuopio University Hospital (Finland).

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**Key Words:** Breast disease, breast cancer, psychosocial risk scale.

Table I. *Characteristics of the study participants. Results are shown for the patients with breast cancer (BC), for those with benign breast disease (BBD) and for the healthy study participants (HSS).*

Variable	BC (n=34)	BBD (n=53)	HSS (n=28)	p-Value
Age (mean, years)	51.6	47.6	45.7	0.12
Height (mean, cm)	164.4	162.3	160.8	0.75
Body weight (mean, kg)	72.5	67.8	68.3	0.25
Age at menarche (mean, years)	13.4	13.4	13.4	0.99
Age at birth of first child (mean, years)	25.2	25.0	25.0	0.92
Age at menopause (mean, years)	47.9	48.9	50.0	0.53
No. of children (mean)	2.6	2.4	2.5	0.27
Parity	31 (91%)	44 (83%)	23 (82%)	0.50
Breast feeding (mean, months)	3.6	3.4	3.9	0.77
Using of oral contraceptives	13 (38%)	25 (47%)	18 (64%)	0.12
HRT	27 (79%)	36 (68%)	14 (50%)	0.44
Premenopausal	13 (38%)	28 (53%)	18 (64%)	0.10
Postmenopausal	21 (62%)	25 (47%)	10 (36%)	0.12
History of previous BBD	18 (53%)	22 (42%)	10 (36%)	0.37
Family history of BC	1 (3%)	5 (9%)	5 (18%)	0.21
Use of alcohol	21 (62%)	31 (58%)	13 (46%)	0.44
Smoking	15 (44%)	21 (40%)	10 (36%)	0.80

HRT, use of hormonal replacement therapy.

## Patients and Methods

The Kuopio Breast Cancer Study is a multidisciplinary cooperative project conducted by different departments of the University of Kuopio and Kuopio University Hospital. The participants of the project included all women who were referred to Kuopio University Hospital (North-Savo Health Care District) for breast examination between April 1990 and December 1995. The Kuopio Breast Cancer Study follows the protocol of the International Collaborative Study of Breast and Colorectal Cancer coordinated by the European Institute of Oncology in Milan, and was initiated as a SEARCH program of the International Agency for Research on Cancer. The collaborative study is based on the assumption that breast cancer and colorectal cancer may have common risk factors. Study centers for the breast cancer study are situated in Canada, Finland, Greece, Ireland, Italy, Russia, Slovakia, Spain and Switzerland (27). The participants of the Kuopio Breast Cancer Study consisted of individuals showing breast cancer symptoms (a lump in the breast or in the axilla, pain in the breast, bleeding from the nipple, nipple discharge and skin dimpling), or an abnormality of the breast detected during outpatient consultations for women referred to the Surgical Outpatient Department at the Kuopio University Hospital, Finland. There had been no pre-selection of the study participants and the indications for referral in this study are in line with our previous results in a Breast Cancer Diagnostic Unit in Finland (28). We maintain that our study sample can be considered clinically representative this type of prospective case-control study design.

This case-control study is an extension of Kuopio Breast Cancer Study (29-30). The study was approved by the Joint Committee of the University of Kuopio and Kuopio University Hospital. Participation was based on written consent. Women with breast symptoms or a suspect breast lump had been referred by physicians to the Kuopio University Hospital (Finland) during the study period from January 1991 to June 1992. Women were asked to participate in the study and were interviewed by a psychiatrist (P.O.) before any

diagnostic procedures (clinical examination and biopsy), so neither the interviewer nor the patient knew the diagnosis at the time of the interview. The interviews were tape recorded (P.O.), and the ratings were completed before the final diagnosis. The clinical examination, mammography and biopsy showed breast cancer in (BC) 34 (29.6%) patients, benign breast disease (BBD) in 53 (46.1%) patients and 28 (23.4) patients with healthy breasts (HSS) (Table I).

*Assessment of life events and stress.* The research method was a semistructured in-depth interview. At the beginning of the interview, the patients drew their 'life lines' and a line describing being a woman, which supported the interview. In 'the draw a line of your life' the patient was asked to draw positive life experiences ('good times') with lines pointing upwards and negative life experiences ('hard times') with lines pointing downwards. Adverse and stressful life events were evaluated over the whole lifespan, with particular reference to the previous 10 years before admission. The adverse or stressful life events and the context surrounding them was marked on the 'life line paper' during the interview. After the interview were rated (by P.O.) the life events according to the degree of threat or stress they were likely to pose, and each adverse or stressful life event was graded on a 5-point scale, grade I (one point) indicating non-threatening event and grade V (5 points) a severely threatening event. The used defences were also assessed on a 5-point scale: grade I (one point) indicating very defensive, in denial and grade V (5 points) non-defensive. The 'Working through and actively confronting the stressful event' variable was also rated on a 5-point scale: grade I (one point) indicating not resolved and grade V (5 points) fully resolved. These measurements were put together in the final statement, 1 to 2 points on the scale means little or mild loss or stress, and 5 means very hard loss or stress.

The rated case record includes the loss events from childhood (under three years of age and 4-12 years of age), adolescence (13-23 years of age), adulthood and especially the last 10 years prior to the investigation.

*Assessment of idealization.* The characteristics of the idealization of childhood and adolescence, of womanhood and motherhood, of own children, spouse and parity, and the idealization of present life-situation and of life in general in the BC, BBD and HSS groups were estimated using the 3-point scale: grade I, no idealization; grade II, mild/moderate idealization; grade III, severe idealization.

*Coping and defence strategies.* A modified Haan coping and defence inventory (31) was used. This inventory is divided into ten scales, and each scale has subscales from grade 0 to grade 3: with 0 meaning no definition, 1=coping, 2=defending and 3=fragmentation. In addition, the researchers estimated the patients' ability to cope (scale 1 to 5), the amount of defensiveness (scale 1 to 5), and fragmentation (scale 1 to 5).

*Beck depression inventory (BDI).* The women completed the BDI (32, 33) with 21 variables. The investigator used the modified inventory divided into three grades: grade I (score 0-13), no depression; grade II (score 14-24), moderate depression; grade III (score over 24), severe depression.

*Spielberger trait inventory.* All study participants completed the Spielberger trait inventory (34). Trait anxiety was assessed using the subscale from the Inventory, and the 10 items defer to how a person generally feels, with a higher total score reflecting a higher anxiety trait (20-80 range). The investigator rated the test as follows: grade I (score 20-29), seldom anxious; grade II (score 30-49), sometimes anxious; grade III (score 50-69), often anxious; grade IV (score 70-80), always anxious.

*Montgomery Åsberg Depression Rating Scale (MADRS).* The MADRS with 10 variables (scores from 0 to 6) was used to evaluate the depression of the study participants (35), and the test was rated as follows: grade I (scores 0-6), no depression; grade II (score 7-19), mild depression; grade III (score 20-34), moderate depression; and grade IV (score 35-60), severe depression.

*Assessment of psychosocial risk using Wirsching et al.'s PRS.* The classification of Wirsching *et al.* introduces 12 variables and the variables measure personality and psychosocial stress. We used a modified PRS for psychosocial risk assessment (15, 24) with 12 scales; each scale has subscales from grade 1 to grade 5. The researchers estimated the patients' psychosocial risk and the test was rated as follows: grade I (subscale grade 3), low psychosocial risk; grade II (subscale grade 2 and subscale grade 4), moderate psychosocial risk; grade III (subscale grade 1 and subscale grade 5), high psychosocial risk for breast cancer.

*Statistical analysis.* Significance of the results was calculated with the SPSS/PC statistical package (SPSS Inc., Chigaco, IL, USA). Correlations and differences between the study groups (BC, BBD and HSS groups) were measured with the 2-sided Chi-square test and non-parametric Kruskal-Wallis variance analyses. Results were considered statistically significant at a  $p$ -value  $<0.05$ . Associations between the major study variables and breast cancer risk were analysed by unconditional logistic regression to estimate risk ratios (RRs) and 95% confidence intervals (CI).

## Results

The mean age of the breast cancer (BC) patients was 51.5 years. The corresponding figures for the patients with benign breast disease (BBD) were 47.5 years and for the HSS group 45.7 years. Although the patients in the BC group were older than those in the BBD or HSS groups, the age difference was not statistically significant ( $p=0.12$ ). The majority of the patients (85/115, 74%) were married or living in a steady relationship. Almost half of the women (41.7%) had completed primary school, and 25% had a college education. By profession, the patients represented industrial and service employees (25.2%), office employees (10.4%), health care employees (8.7%), and farmers (8.7%), and almost 23.5% were retired. The combined mean gross income of both spouses in the patients with BC was 36,100 € per year. The corresponding figures for the patients with BBD were 27,714 € per year. The patients with BC were significantly ( $p=0.03$ ) wealthier than the patients with BBD and HSS, as estimated by the combined gross income of the both spouses. The groups differed only slightly from each other as to the factors of the reproductive life of the women (Table I).

*Psychological self-report questionnaires (BDI and STI) and MADRS.* The mean BDI score (SD) of the BC group was 8.4 (6.9) and 8.8 (7.4) and 7.1 (7.3) ( $p=0.5$ ) for the BBD and HSS groups, respectively. The mean MADRS score (SD) of the BC group was slightly higher at 11.4 (9.2) than that of the BBD group, at 10.7 (9.2) and the HSS group, at 8.4 (9.7) ( $p=0.23$ ). The mean (SD) STI differed only slightly between the BC group, at 40.1 (8.6), the BBD group, at 41.5 (7.2) and the HSS group, at 39.1 (6.4) ( $p=0.20$ ).

*The characteristics of Wirsching et al.'s PRS.* The characteristics of the PRS in the BC, BBD and HSS groups were categorized according Wirsching *et al.* The characteristics of the PRS functions in the study subjects are presented in Tables II, III. The mean sum of the scores of PRS functions were significantly higher in the BC group than in the BBD or HSS groups. However, the mean scores for the PRS for HSS, for BBD and for BC groups differed only slightly when the PRS functions were considered separately (Tables II, III). The BC group used more suppression of feelings, optimism, self-sufficiency, rationalizing attitude, remoteness, harmonizing behaviour and altruism than the BBD and HSS groups according to Wirsching *et al.*'s classification (Figure 1).

*The characteristics of the personality variables according to Wirsching et al's PRS classification.* The characteristics of the personality variables in the BC, BBD and HSS groups are provided in Tables II and IV. The variables are shown as

Table II. The personality variables according to Wirsching *et al.*'s classification scales. Each scale has subscales from grade 1 to grade 5. The patients' psychosocial risk was rated in three grades\*.

A. Psychosocial stress	F. Rationalizing attitude
1. Severe stress	1. Highly rationalizing
2. Apathy	2. Rationalizing
3. Moderate stress	3. Balanced
4. Weak stress	4. Emotional
5. No stress	5. Highly balanced
B. Suppression of feelings	G. Harmonizing behaviour
1. Negative	1. Harmonic
2. Repressive	2. Controlled
3. Adequate	3. Adequate
4. Outbursting	4. Aggressive
5. Labile	5. Hostile
C. Optimism	H. Altruism
1. Hopeless	1. Devoted
2. Pessimistic	2. Careful
3. Realistic	3. Normal
4. Optimistic	4. Demanding
5. Euphoric	5. Egoistic
D. Self-sufficiency	I. Anxiety
1. Helpless	1. Panic
2. Dependent	2. Anxious
3. Balanced	3. Troubled
4. Independent	4. Trouble-free
5. Self-supporting	5. Brave
E. Remoteness	J. Cares about her health
1. Longing to be alone	1. Ruining her health
2. Reserved	2. Unconcerned about her health
3. Communicating	3. Fair
4. Social	4. Cares about her health
5. Talkative	5. Hypochondriac

\*Grade I (subscale grade 3), low psychosocial risk; grade II (subscale grade 2 and subscale grade 4), moderate psychosocial risk; grade III (subscale grade 1 and subscale grade 5), high psychosocial risk for breast cancer.

the 'good personality variables' and as the 'poor personality variables' (Tables II and IV). The patients with breast cancer had significantly more 'poor personality variables' (19/34 patients, 56%) than the patients with BBD (severe idealization in 17/53 patients, 32%) or the HSS group (8/28 patients, 29%) ( $p=0.04$ ).

*Study variables and breast cancer risk ratio (RR).* The variables in this study and breast cancer risk ratio (RR) with 95% CI and  $p$ -value of significance are shown in Table V. The 'idealization' variable characterized here correlated slightly with increased breast cancer risk ( $RR=1.6$ ).

Table III. The mean (SD) scores for the psychosocial risk scale (PRS) for the healthy study participants (HSS), for the patients with benign breast disease (BBD) and for the patients with breast cancer (BC).

Study function	Mean score (SD)			$p$ -Value (overall)
	BC	BBD	HSS	
A. Psychosocial stress	2.2 (0.92)	2.3 (0.9)	2.0 (0.92)	0.67
B. Suppression of feelings	2.1 (0.64)	1.8 (0.72)	1.7 (0.6)	0.06
C. Optimism	2.1 (0.65)	1.8 (0.65)	1.7 (0.6)	0.22
D. Self-sufficiency	2.0 (0.67)	1.9 (0.72)	1.9 (0.69)	0.91
E. Remoteness	2.0 (0.76)	1.9 (0.81)	1.6 (0.62)	0.17
F. Rationalizing attitude	2.0 (0.63)	1.7 (0.63)	1.9 (0.52)	0.11
G. Harmonizing behaviour	2.0 (0.74)	1.7 (0.67)	1.8 (0.74)	0.35
H. Altruism	1.9 (0.69)	1.7 (0.71)	1.7 (0.76)	0.49
I. Anxiety	1.6 (0.55)	1.5 (0.54)	1.6 (0.5)	0.50
J. Cares about her health	1.4 (0.5)	1.4 (0.56)	1.4 (0.63)	0.32
Psychosocial risk ( $\Sigma$ )	19.4 (3.9)	17.6 (4.1)	17.2 (4.1)	0.05

Table IV. The personality variables according to Wirsching's psychosocial risk scale (PRS) for the healthy study participants (HSS), for the patients with benign breast disease (BBD) and for the patients with breast cancer (BC).

Personality variables	HSS		BBD		BC		$p$ -Value (overall)
	N	%	N	%	N	%	
	28	100.0	53	100.0	34	100.0	
Good <sup>1</sup>	20	71	36	68	15	44	0.04
Poor	8	29	17	3	19	56	

<sup>1</sup>Wirsching *et al.* classification scores 1-3 and 4-5 are summarized.

Table V. The study variables and the breast cancer risk ratio (RR) with 95% confidence interval (CI) and  $p$ -value of significance.

Study variable	RR	CI	$p$ -Value
Idealization	1.6	(1.1-2.5)	0.03
Spielberger (A-trait)	1.0	(0.95-1.11)	0.49
MADRS	1.0	(0.95-1.11)	0.37
Beck (BDI)	1.0	(0.92-1.11)	0.86
Forsen score			
0-2 years	1.0	(0.96-1.04)	0.92
2-6 years	1.0	(0.96-1.09)	0.21

## Discussion

In Finland, 4,073 new cases of female breast cancer were diagnosed in 2006, accounting for 31.4% of all cancer in women (36) and corresponding to an age-adjusted incidence rate of 86.6 cases per 100,000 women per year. The overall 5-year survival rate of breast cancer patients is close to 80%



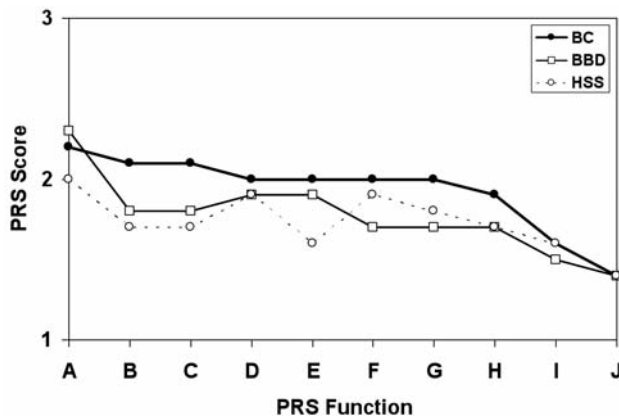


Figure 1. The mean psychosocial risk scores (PRS 1=low risk, PRS 2=moderate risk, PRS 3=high risk) of the PRS functions were higher in the patients with breast cancer (BC) than in the patients with benign breast disease (BBD) and in the healthy study participants (HSS).

in Finland, even though 856 breast cancer deaths were documented in 2006 in Finland (36).

Epidemiological research on personality and breast cancer risk has been motivated by theories of a so-called 'cancer-prone personality' (37). Case-control and cohort studies take into account personality and confounding factors at the individual level. Epidemiological studies of these factors and breast cancer risk are more common because they are easier, quicker and cheaper to carry out than the case-control and cohort studies.

The important bias related to case-control studies is recall bias, which occurs, for example, if cases report their life experiences differently from controls. This may happen because they have often thought about their previous experiences in order to find causes for their breast cancer. To avoid recall bias, we conducted this case-control study with a so called 'limited prospective study design': women were asked to participate in the study, were interviewed and reports on psychological factors were obtained before any diagnostic procedures, so neither the investigator nor the participants knew the diagnosis at the time of interview. However, the patients were encountered in an extremely stressful situation before the diagnosis. It can be assumed that on the basis of clinical impressions, some of the patients had already been given more or less clear hints by their doctors on their expected diagnosis. One potential bias comes from age being a confounding factor, and some studies have been criticized on such methodological grounds as limited controlling for age (38). In our study, the BC group was 4.0 years and 5.9 years older than the BBD group and the HSS group, respectively. However, no statistically significant age difference between these groups was found ( $p=0.12$ ). The participants of our study consisted of individuals showing breast cancer symptoms (a lump in the breast or in the axilla, pain in the breast, bleeding from the nipple, nipple discharge and skin dimpling), or an abnormality of the breast detected during

outpatient consultations referred to the Surgical Outpatient Department at the Kuopio University Hospital, Finland. There had been no pre-selection and the indications for referral in this study are in line with our previous results in a Breast Cancer Diagnostic Unit in Finland (28). We maintain that our study sample can be considered clinically representative for this type of prospective case-control study design. It should be noted that the control group (healthy individuals) of our study is not representative of the whole population, since it consists of women who presented primarily with breast symptoms.

The study sample can be considered clinically representative of this type of prospective case-control study design if the variables characterized by the investigator and these characterized by the participants correlate. In our study, the variables reported by the investigator, the 'MADRS' and 'depression' variable correlated with high significance ( $p$ -value  $<0.001$ ) with those variables reported by the study participants, BDI, A-trait, Forsen score 0-2 years and Forsen score 2-6 years. The 'anxiety' variable characterized by the investigator correlated with the A-trait and Forsen score 0-2 years variable reported by the study participants ( $p$ -value  $<0.05$ ).

In summary, our findings of a weak relationship between PRS score and breast cancer risk are in line with the findings Wirsching *et al.* (15, 26), who specifically investigated the psychological identification of breast cancer patients before biopsy.

## Conclusion

The results of this study support a weak association between Wirsching *et al.*'s PRS score and breast cancer risk. However, the biological explanation for the association is unclear and the exact effects of psychological factors on the various hormones relevant to development of breast cancer are at present poorly defined. It might be that psychological factors impact indirectly by affecting behaviours such as diet or sleep or, directly on neuroimmunological or hormonal systems.

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