Levels of Anxiety and Depressive Symptoms in Breast Cancer and Colorectal Cancer Patients: the Differences and the Role of Mindfulness

Master Thesis Medical Psychology

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Abstract

Objective: Patients with breast or colorectal cancer report high levels of depressive symptoms and anxiety. Cancer has a major impact on the lives of patients with both cancer types. Therefore, the aim of this study was to examine and compare the course of depressive symptoms and levels of anxiety in breast cancer and colorectal cancer patients, which were measured during treatment and during follow up. Furthermore, the relation of mindfulness on the development of depressive and anxiety symptoms during the course of the cancer process was examined.

Method: Three questionnaires were completed at three time-points with an interval of three months, by patients with breast cancer and by patients with colorectal cancer undergoing treatment with a curative intent (N=70). These included the Center for Epidemiological Studies — Depression Scale, the State-Trait Anxiety Inventory, and the Three Facets of Mindfulness Questionnaire.

Results: No significant main effects of tumor type on depressive and anxiety symptoms ($p=0.724$ and $p=0.794$) were found. A significant main effect of the treatment phase on depressive symptoms ($p=0.004$) and a marginal significant main effect on levels of anxiety was found ($p=0.064$). Furthermore, there is a significant negative relation between all three facets of mindfulness ("acting with awareness", "non-judging", and "non-reacting") and levels of anxiety ($p<0.001$, $p=0.001$, and $p=0.002$) and depressive symptoms ($p<0.001$, $p<0.001$, and $p=0.038$).

Conclusion: Patients scored significantly higher on depressive symptoms and marginal significantly higher on levels of anxiety during the active treatment phase, compared to those in the follow up phase. In addition, a mindful attitude appears to be a potential protective variable against the development of anxiety and depressive symptoms. These findings should be interpreted with caution, as subgroups were relatively small.

Key words: breast cancer, colorectal cancer, depressive symptoms, CES-D, levels of anxiety, STAI-S, mindfulness, TFMQ.

Motivation

The reason for this research is a striking observation by the nursing staff from two different departments for treatment of cancer patients. At the department that focuses on breast cancer, staff said that patients with comorbid levels of anxiety and depressive symptoms benefited from psychological help. The nursing staff of the colorectal cancer patients, however, claimed that psychological help for their patients offered no added value. Their view was supported by the results of the distress thermometer (screening instrument to measure distress among cancer patients), which in the case of colorectal cancer patients showed no indication of anxiety or depressive symptoms.

Introduction

Both breast cancer and colorectal cancer have a high prevalence worldwide [1, 2]. Within the male population, colorectal cancer is the third most common type of cancer, while it is the second most common type for women, worldwide [1]. In 1998, one out of nine women were diagnosed with breast cancer in The Netherlands [3]. Today, the chances have increased, with one out of seven women being diagnosed with breast cancer in 2015 in The Netherlands. Moreover, every year, 3200 Dutch people die due to the consequences of breast cancer [4].

Bultz and Carlson claimed, in their article, that a cancer diagnosis turns people's lives upside down [5]. From one day to another, new cancer patients must deal with a potential life-threatening disease and its emotional consequences [6, 7]. After diagnosis, every patient undergoes the universal five stages of mourning: denial and isolation, anger, bargaining, depression, and acceptance [8]. Cancer, as well as its treatment, may lead to functional restrictions and disabilities, which may cause a variety of psychological problems. According to

Oktay, Spiegel, Woods and Williams, and Spijker and colleagues, the most common psychological reactions during the detection and treatment of cancer are anxiety and depressive symptoms [9-12].

Cancer is a threatening disease which can make patients anxious. Sometimes the anxiety becomes a clinical problem and can be diagnosed as an official anxiety disorder. Typical symptoms of this affect disorder are autonomic overactivity including sweating and palpitation, restlessness, reassurance seeking, poor concentration, fatigue, and muscle tension. As a clinical problem, anxiety can be identified in the case of overreactions reaching threatening levels, persistence of deterioration without intervention, unrealistic psychological symptoms in respect to the level of threat (panic attacks and abnormal beliefs), or interruption in the patient's daily life [13]. Literature showed that 8.6-49.6% of cancer patients experienced high levels of anxiety [14, 15]. Female patients reported significantly higher levels of anxiety than male patients. One study showed that older breast cancer patients experienced lower levels of anxiety compared to younger patients [16]. Another study confirmed this difference: patients who aged 70 and older experienced lower levels of anxiety, compared to younger patients. However, this study also found that patients aged under 30 also experienced lower levels of anxiety [17].

Another psychological reaction to the diagnosis of cancer is the experience of depressive symptoms. Typical depressive symptoms are fatigue and decreased energy, feelings of hopelessness, insomnia or excessive sleeping, irritability or restlessness, overeating or loss of appetite, and loss of interest in activities that were once pleasurable [18]. Depressive symptoms have a negative impact on the quality of life [19, 20], as well as on social relations and functional status [21, 22]. According to Spiegel, Buccheri, and Colon and colleagues, these symptoms even affect the medical outcomes and could also affect survival time negatively [10, 23, 24]. This

supports the importance of pursuing research into cancer and its psychological consequences. Several studies estimated that 14-54% of the cancer patients experienced depressive symptoms [14, 15, 23, 25-27], compared to only 10-28% of the general population [28]. The wide variation of this prevalence in cancer patients is due to the type of cancer and its treatment. In addition, this variation can be explained by the fact that some of the most characteristic somatic features of depression (e.g. fatigue, sleep problems, and lack of appetite) are effects of the disease or the treatment [29].

Other studies questioned whether depressive symptoms are associated with demographic variables, such as age, marital status, and gender [30]. One study focusing on breast cancer patients showed that older patients have lower scores on depressive symptoms compared to younger patients [16]. Considering gender differences, it may be concluded that within the general population, the females manifest more depressive symptoms than males [31]. Furthermore, women have a tendency to search for help sooner in the case of depressive symptoms than men [32]. Another study showed that 33% of the interviewed women and only 19% of the interviewed men with depressive symptoms were in need of professional help [33]. Cochran and Rabinowitz explained this attitude, arguing that searching for help is in conflict with men's self-image of being able to solve problems independently [34].

Regarding the differences between the breast cancer and the colorectal cancer population, studies showed that both populations reported high levels of depressive symptoms and anxiety [1, 2, 35, 36]. Many studies investigated depressive symptoms and anxiety within the breast cancer population. Few studies exist that have examined the course of depressive symptoms and levels of anxiety in colorectal cancer patients. In their study, Nordin and colleagues compared the levels of anxiety and depressive symptoms in four types of cancer (breast, colorectal, gastric,

and prostate cancer). This study showed that patients with breast cancer reported significantly higher levels of anxiety than patients with colorectal cancer. No significant differences were found on depressive symptoms between breast and colorectal cancer patients [29]. Whereas the study of Stommel and colleagues found, that colorectal cancer patients experienced more depressive symptoms than breast cancer patients [37]. The inconsistency in the findings in the two studies could be a result of the methodological differences.

It is known that levels of anxiety and depressive symptoms in cancer patients improve during the first year after diagnosis [29, 37-42]. 40.9% of the women reported depressive symptoms before the diagnosis, whereas this percentage diminished with 13.1% after one year [2]. However, 20-30% of the cancer patients, both women and men, continued to experience elevated levels of anxiety and depressive symptoms during follow up [39-42]. Another study found that levels of anxiety in breast, colorectal, gastric, and prostate cancer decreased over time [29]. At diagnosis, breast cancer patients reported significantly higher levels of anxiety, compared to colorectal cancer patients, whereas no significant differences between these two populations were found after six months. According to this article, the differences between the breast and colorectal cancer patients diminish over time [29]. In conclusion, few studies examined and compared the depressive symptoms and levels of anxiety from patients with breast or colorectal cancer. More research is necessary.

The diagnosis of a disease such as cancer results in a complex set of psychological issues and physical restrictions that may contribute to depressive symptoms and anxiety [43]. Mindfulness Based Therapy (MBT) is found to be beneficial for psychological problems, according to Speca and colleagues [44]. Mindfulness, which is based on Buddhist meditation, is a mental state that is characterized by nonjudgmental awareness of the present moment. It entails

including one's consciousness, sensations, thoughts, bodily state and the environment, while encouraging openness, curiosity, and acceptance. MBT helped people in learning to respond differently to difficult situations [45-47]. Based on the literature, it can be claimed that MBT reduces levels of stress, anxiety and depressive symptoms [48-56]. Previous studies showed that MBT significantly improves the coping with medical conditions such as cancer [51, 57]. A higher level of the mindfulness facet, acting with awareness of the present moment, predicted a lower level of depressive symptoms [58].

Departing from the premise that little is known about the course of depressive symptoms and the levels of anxiety when a comparison is made between treatment and follow up, the aim of this prospective study is to examine and compare the course of depressive symptoms and the levels of anxiety in breast cancer and colorectal cancer patients, which were measured during treatment (surgery, chemotherapy, and radiotherapy) and during follow up. Furthermore, the relation of mindfulness on developing depressive and anxiety symptoms during the course of the cancer process will be examined. Based on the literature, it is hypothesized that colorectal cancer patients will have higher scores on depressive symptoms than the breast cancer population [37]. Regarding anxiety levels, it is hypothesized that breast cancer patients will have higher levels of anxiety than colorectal cancer patients [29]. In addition, it is hypothesized that the levels of anxiety and depressive symptoms will decrease over time. Consequently, lower scores on depressive symptoms and lower levels of anxiety are expected to be found during follow up [2, 29, 38]. Also based on the literature [48-56], it is hypothesized that mindfulness is a potential predictor for fewer depressive symptoms and lower levels of anxiety.

Methods

This study is performed in co-operation with Tilburg University and Máxima Medical Centre (MMC) in Eindhoven. It is conducted within a population of patients who have been diagnosed with breast cancer and colorectal cancer in the MMC, and examined the levels of anxiety and the amount of depressive symptoms. It is one component in a larger research project, which examined the operating characteristics of the Distress Thermometer (DT). This study was approved by the Medical Ethics Committee of the MMC in Eindhoven, The Netherlands.

Participants

The studied population consisted of patients who have been diagnosed with breast cancer or colorectal cancer undergoing treatment with a curative intent at the MMC. This included patients who were in both treatment and follow up phases. The patients were over the age of 18, physically and mentally capable of filling in the questionnaires, and had sufficient knowledge of the Dutch language.

Sample size

The statistical test: 'ANOVA: Repeated measures, between factors', was used a priori to calculate the sample size. An alpha level of 0.05, power of 0.8, an effect size of F=0.25, a number of two groups and a number of two measurements was used to determine the sample size with G*power 3.1.5. According to the power analysis, the total sample size of this study should be 98 patients. However, the mean dropout rate of three similar studies was 23% [59-61] Therefore, a dropout rate of 23% is also expected in this study, resulting in a total sample size of 121 patients.

Procedures

The patients in this study were recruited in the MMC. Patients visited the hospital for regular appointments during their treatment or during follow up. Referral took place by the case-managers or nurse practitioners. Patients were asked to participate in this study during an appointment with their case-managers. Each patient who met the inclusion criteria was informed about the study goals and their right to withdraw from participation at any time and without consequences. Subsequently, they were asked to sign an Informed Consent, stating that they agreed to participate. Only when they signed the Informed Consent, patients received the first questionnaire. They received psychological questionnaires on depressive symptoms, anxiety, and three facets of mindfulness (the total number of questions was 55, with an estimated completion time of approximately 30 minutes). A return envelope was included so that patients could complete the questionnaires at home and send them back to the hospital for analysis. The participants received the same questionnaires an additional two times, at intervals of three months.

Materials

The demographic characteristics (sex and age) and illness-related characteristics (tumor type, treatment phase and kind of treatment received) were obtained through the use of a self-report questionnaire.

Center for Epidemiological Studies Depression Scale (CES-D)

Depressive symptoms in cancer patients were measured by the CES-D [62, 63]. It is a short version of a self-report scale designed to measure depressive symptoms over the preceding week. It consists of 20 items on a 4-point Likert scale within four different subscales (“Somatic-

Retarded Activity", "Depressed Affect", "Positive Affect", and "Interpersonal Affect"). The standard cut-off for the CES-D is a sum score of ≥ 16. The CES-D has demonstrated good internal consistency (Cronbach's alpha of 0.89) and the construct validity is acceptable [62].

State Trait Anxiety Inventory (STAI)

The STAI is a self-report questionnaire with two subscales that measures two concepts of anxiety: trait anxiety (STAI-T) and state anxiety (STAI-S) [64]. Both scales have 20 items on a 4-point Likert scale. The STAI-S was used in the current study and measures how a person feels at a certain moment. The cut-off score for the STAI-S is a sum score of ≥ 40 [65]. The STAI-S has shown good validity in a wide variety of populations and good reliability (Cronbach's alpha ranges from 0.83 to 0.92) [66].

Three Facet Mindfulness Questionnaire - Short Form (TFMQ-SF)

The short version of the Five Facets of Mindfulness Questionnaire (FFMQ) was developed to measure three facets of mindfulness: "acting with awareness", "non-judging", and "non-reacting". The Dutch version of the short TFMQ has 15 items on a 5-point Likert-scale [67]. The three facets selected from the FFMQ have been proven to be valid and reliable (Cronbach's alpha of 0.83 for "acting with awareness", 0.83 for "non-judging", and 0.75 for "non-reacting"). The Dutch TFMQ-SF has shown adequate psychometric properties [68].

Statistical analysis

In the original study design, there were three different time points, with an interval of three months, in which the patients received the questionnaires. Due to the fact that in the first time point, not all of the patients were in equal treatment phases, in this study the variable "treatment phase" was used, divided into two groups: t_0 = "during treatment" and t_1= "during

follow up". A few patients completed the questionnaires at more than one time point, with the ultimate of three measuring points per patient.

All statistical analyses were performed with SPSS version 22. Descriptive statistics will be calculated for the variables: gender, age, and treatment phase. Two tests will be used to examine differences between participants and non-participants, and differences between breast and colorectal cancer patients. For the discrete variable age, student t-tests will be used, and for the categorical variables gender and treatment phase chi-square tests will be used. In this study, no analyses between completers and non-completers were executed, because of the small group of non-completers. A reliability check was performed on the questionnaires' scales.

Linear mixed-models analysis was used to test the hypotheses. This form of analysis was used instead of repeated measures analysis of variance in order to make more efficient use of the data. Linear mixed-models analysis used all data points.

The dependent variables are depressive symptoms and levels of anxiety. For each dependent variable, two different models were executed. In all models, treatment phase, tumor type, and the dependent variable were used. In the first model, the three facets of mindfulness, "acting with awareness", "non-judging", and "non-reacting" were used. Additionally, as gender and age may influence the outcomes [16, 17, 30, 31] a second model was created in which these factors were added as independent variables. The three facets of mindfulness were used and the outcomes were controlled by age and gender.

To check the magnitude of the effects, effect sizes will be calculated using Cohen's d. The statistical differences will be listed if $p < 0.05$.

Results

Six assumptions had to be fulfilled: assumption of linearity, absence of collinearity, homoscedasticity, normality of residuals, absence of influential data points, and independence. All assumptions were checked and it was permitted to run the analyses.

In total, 70 patients (83.3%) with breast and colorectal cancer agreed to participate in this study, and 14 patients (16.7%) refused to participate. Non-participants were significantly older than participants (68.5 years ± 10.6 versus 59.0 years ± 9.7; $p<0.001$). In addition, the group of participants and the group of non-participants differed significantly in gender ($p=0.004$). There were eight men and six women in the group of non-participants.

The demographic and clinical features of patients with breast cancer and colorectal cancer patients are reported in Table 1. Colorectal cancer patients were significantly older than breast cancer patients (63.8 years ± 7.7 versus 56.5 years ± 9.7; $p<0.001$). In addition, the group of breast cancer and the group of colorectal cancer differed significantly in gender ($p<0.001$). There were only women in the group with breast cancer. The estimated marginal means of depressive symptoms and levels of anxiety, divided in tumor type and treatment phase, are reported in Table 2.

Table 1

Demographic and Clinical Features of Patients with Breast Cancer and Colorectal Cancer (N=70).

	Breast cancer (N=46)		**Colorectal cancer (N=24)**	
Treatment phase T1		%		%
During treatment	11	28.9	16	94.1
In follow up	27	71.1	1	5.9
Treatment phase T2				
During treatment	8	23.5	7	53.8
In follow up	26	76.5	6	46.2
Treatment phase T3				
During treatment	2	9.1	2	25.0
In follow up	20	90.9	6	75.0

Table 2

Estimated Marginal Means (SE) of the Dependent Variables.

	Depressive Symptoms	Levels of Anxiety
Tumor type		
Breast cancer	12.6 (1.6)	39.5 (2.1)
Colorectal cancer	13.5 (1.4)	38.7 (1.8)
Treatment phase		
Active treatment	15.4 (1.3)	41.0 (1.6)
Follow up	10.7 (1.1)	37.1 (1.5)

The Effect of Depressive Symptoms

Model two, the most complete model, is the first model that it is going to be discussed. Mixed-models analyses showed no significant main effect of tumor type ($F(1,103) = 0.13$, $p = 0.724$). The effect of tumor type had about a small effect size ($d = 0.08$). Furthermore, the analyses showed a significant main effect of treatment phase ($F(1,118) = 8.60$, $p = 0.004$). Patients in treatment phase scored higher on depressive symptoms compared with patients in follow up phase. The effect of treatment phase had about a medium effect size ($d = 0.44$). Three other significant main effects were found: the effects of all three facets of mindfulness, "acting with awareness" ($F(1; 85) = 36.36$, $p < 0.001$), "non-judging" ($F(1; 103) = 13.74$, $p < 0.001$), and "non-reacting" ($F(1; 117) = 4.42$, $p = 0.038$). Patients with a high score on depressive symptoms scored lower on the mindfulness' facets "acting with awareness" (coefficient = -1.144), "non-judging" (coefficient = -0.716), and "non-reacting" (coefficient = -0.317). The facet "acting with awareness" had the greatest effect on depressive symptoms. In this model, the scores were controlled for age and gender. Gender ($F(1,112) = 1.59$, $p = 0.210$) and age ($F(1,110) = 2.21$, $p = 0.140$) had no significant effect on depressive symptoms. Fit indices of this second model were as follows: -2 Restricted Log Likelihood=888.651, Akaike's Information Criterion (AIC) = 894.651, Schwarz's Bayesian Criterion (BIC) = 903.063.

In model one, the variables age and gender were not taken into account. The only difference between this model and the second model is a marginal significant effect of the mindfulness' facet "non-reacting" ($F(1;121) = 3.10$, $p = 0.081$) (coefficient= -0.256). Fit indices of this first model were as follows: -2 Restricted Log Likelihood=892.861, AIC = 898.861, BIC = 907.322. More details regarding the coefficients of depressive symptoms of both models are reported in Table 3.

After checking fit indices model two appeared to be the best, all interpretations for the main conclusions derived from model two.

Table 3

The Coefficients of the Effects of the Mixed-Models Analyses for Depressive Symptoms

	Model 1: scores on the three facets of the mindfulness questionnaire.	Model 2: scores on the three facets of the mindfulness questionnaire, controlled for age and gender.
Intercept	49.732**	60.441**
Breast cancer[a]	1.863	-0.842
Treatment[b]	4.518**	4.713**
Aware[c]	-1.231**	-1.144**
Non judge[d]	-0.624**	-0.716**
Non react[e]	-0.256#	-0.317*
Age		-0.121
Male		-3.535

** p<0.01 * p<0.05 #P<0.10

[a] *Note: Breast cancer indicates the coefficients on depressive symptoms compared to colorectal cancer patients*

[b] *Treatment indicates the coefficients on depressive symptoms derived from patients in the active treatment phase compared to patients in the follow up phase*

[c] *Score on the sub facet "acting with awareness" of the mindfulness questionnaire (TFMQ)*

[d] *Score on the sub facet "non-judging" of the mindfulness questionnaire (TFMQ)*

[e] *Score on the sub facet "non-reacting" of the mindfulness questionnaire (TFMQ)*

The Effect of Levels of Anxiety

Model two is also the first model that it is going to be discussed with the other dependent variable "levels of anxiety". Mixed-models analyses showed no significant main effect of tumor type ($F(1,112)=0.07$, $p=0.794$). The effect of tumor type had about a small effect size ($d=0.06$). Furthermore a marginal significant effect of treatment phase was found ($F(1,117)=3.51$, $p=0.064$). The effect of treatment phase had a small to medium effect size ($d=0.28$). Mixed-model analyses showed three other significant main effects: the effects of the three facets of mindfulness "acting with awareness" ($F(1;109)=27.70$, $p<0.001$), "non-judging"

(F(1;120)=11.52, p=0.001), and “non-reacting” (F(1;120)=10.17, p=0.002). Patients with a high score on anxiety scored lower on the mindfulness’ facets “acting with awareness”, “non-judging”, and “non-reacting”. The facet “acting with awareness” had the greatest effect on levels of anxiety. In this model, the scores were controlled for age and gender. Gender (F(1,114)=0.08, p=0.778) and age (F(1,121)=1.71, p=0.193) had no significant effect on levels of anxiety. Fit indices of this second model were as follows: -2 Restricted Log Likelihood=949.550, AIC = 955.550, BIC = 963.962.

In model one, the variables age and gender were not taken into account and there were no differences between the two models. Fit indices of this first model were as follows: -2 Restricted Log Likelihood=953.116, AIC = 959.116, BIC = 967.576. More details regarding the coefficients of the levels of anxiety of both models are reported in Table 4.

After checking fit indices model two appeared to be the best, all interpretations derived from model two.

Table 4

The Coefficients of the Effects of the Mixed-Models Analyses for Levels of Anxiety

	Model 1: scores on the three facets of the mindfulness questionnaire.	Model 2: scores on the three facets of the mindfulness questionnaire, controlled for age and gender.
Intercept	88.002**	97.893**
Breast cancer[a]	2.080	0.812
Treatment[b]	3.992#	3.866#
Aware[c]	-1.457**	-1.357**
Non judge[d]	-0.798**	-0.877**
React[e]	-0.566**	-0.613**
Age		-0.143
Male		-1.018

** p<0.01 * p<0.05 #P<0.10

[a] *Note: Breast cancer indicates the coefficients on levels of anxiety compared to colorectal cancer patients*

[b] *Treatment indicates the coefficients on levels of anxiety derived from patients in the active treatment phase compared to patients in the follow up phase*

[c] *Score on the sub facet "acting with awareness" of the mindfulness questionnaire (TFMQ)*

[d] *Score on the sub facet "non-judging" of the mindfulness questionnaire (TFMQ)*

[e] *Score on the sub facet "non-reacting" of the mindfulness questionnaire (TFMQ)*

Discussion

The aim of this prospective study was to examine and compare the course of depressive symptoms and the levels of anxiety in breast cancer and colorectal cancer patients, which were measured during treatment (surgery, chemotherapy, and radiotherapy) and during follow up. The main questions were whether the differences between the patient groups in levels of anxiety and depressive symptoms which were observed in clinical practice could be confirmed. Besides fixed variables, such as gender, age, and treatment phase (active treatment vs. follow up), the variable mindfulness was included, as this could lead to additional psychological interventions in reducing the comorbid levels of anxiety and depressive symptoms during cancer treatment.

In this current study no significant differences between breast and colorectal cancer patients were found on levels of anxiety and depressive symptoms. This is in contradiction with the findings in literature, which claimed significant differences between both groups [29, 37]. This inconsistency could be explained by the methodological differences. In the current study the sample size was too small, this makes the statistical power not big enough. There were only 70 participants. In previous studies the sample size was respectively 860 [37] and 527 [29]. Stommel and colleagues [37] restricted the age structure of the study population (>65), whereas this current study used the restriction over 18. In one study [29] the HADS was used to detect the depressive and anxiety symptoms, whereas this current study used CESD and STAI-S, due to the prescribed questionnaires in the ongoing study.

During the active treatment phase patients scored significantly higher on depressive symptoms and marginal significantly higher on levels of anxiety compared to patients in the follow up phase. This corresponded to the findings in literature, [2, 39-42] which claimed reduction in depressive symptoms over time. In this current study, treatment phases were introduced to relate anxiety and depressive symptoms with treatment phases because of the fact that cancer treatment has an increasingly personalized approach; it makes comparison more valid.

Finally, this study focused on the relation between the levels of anxiety and the perceived depressive symptoms and mindfulness. It followed the hypothesis that a mindful attitude is a contribution to cope with medical conditions as cancer [51, 57]. The result of this current study confirmed the hypothesis; patients with a mindful attitude showed significantly lower scores on anxiety, as well as, on depressive symptoms. All three facets of mindfulness had a negative relation with levels of anxiety and depressive symptoms. The strongest contribution appeared to

be obtained from the facet "acting with awareness". These results were similar as found in literature [58]. However, due to the mechanism of causality, this interpretation demanded some caution. The inability of mindful functioning could be attributed to the actual anxiety and depressive symptoms due to the cancer and its treatment. Additionally, the inability to function mindfully could be the cause of anxiety and depressive symptoms during cancer treatment.

Limitations

As described above the final sample size was smaller than expected and this fact made the statistical power not big enough. Therefore the findings of this study should be interpreted with caution. All the more, patients in the two research groups (breast and colorectal cancer) differed significantly in gender and age. In future study the age range could be diminished to reduce the influence of age on the levels of anxiety and depressive symptoms. Due to the small sample size, it was necessary to exclude certain interesting variables. For instance, the relation between the kind of treatment (surgery, chemotherapy, radiotherapy, or hormonal therapy) and levels of anxiety could not be addressed. In addition, in a clinical setting, it was difficult to optimize the inclusion of sufficient patients.

Data gathering was dependent on the nursing staff. The questionnaires were distributed randomly and not at fixed moments of the treatment process. As a result, some patients were familiar with the diagnosis for a longer period than others, or their treatment was in an advanced phase. Lower scores on the anxiety and depressive symptoms questionnaires in the active treatment phase, could have been the result of the fact that depressive symptoms and anxiety reduces over time.

There were no clear appointments about excluding or including patients, other than: over age of 18, sufficient knowledge of the Dutch language and physically and mentally capable of

filling in the questionnaires. Due to the fact that the current study was part of an ongoing study, it was impossible to introduce new appointments about inclusion criteria of fixed measuring points. For future research, the sample size should be much bigger, questionnaires should be distributed at fixed moments of the cancer treatment process by fixed persons.

Finally, this research did not take into consideration the comorbidity of other somatic diseases, though it could be possible that a part of the research population suffered from various somatic complaints. This raises the question of whether anxiety and depressive symptoms were a comorbid problem for cancer patients in general, or that the levels of anxiety and depressive symptoms could be explained by the impact of comorbid somatic diseases.

Implications

One of the purposes of this research project was to examine the relation between levels of anxiety and depressive symptoms and the treatment phase. As previously described, the literature showed a significant reduction of anxiety and depressive symptoms over time [2, 39-42]. A common explanation for this was found in the literature that focused on grieving. Being confronted with the often unexpected diagnosis of cancer and participating in long-lasting treatment which is often experienced as intense and uncontrollable, might result in the process of grief [8]. The levels of anxiety and depressive symptoms decreased when treatment had been completed and patients found a way of adapting. In future research, it may be interesting to examine the relation between anxiety/ depressive symptoms and the phases of grief specifically. A possible hypothesis would be that the treatment of cancer is intense, unpredictable and uncontrollable, and results in anxiety and depressive symptoms, whereas the follow up phase raises existential questions with existential feelings of anxiety and depressive symptoms. Research can fine-tune the relation between grief and anxiety- and depressive symptoms, which

may result in tangible interventions in dealing with these levels of anxiety and depressive symptoms, rather than ignoring or denying them.

In addition to the limitations of this study mentioned above, the focus on the effect of mindfulness on anxiety and depressive symptoms could be considered a strong contribution to the field. The variables of gender, age, type of cancer, and treatment phase were fixed variables, and interesting for scientific purposes. However, they offered barely any indications for intervention and manipulation, and could therefore hardly be used for individual cancer patients (and their treatment staff) suffering from comorbid anxiety and depressive symptoms during intense and often long-term treatment. On the other hand, mindfulness was a variable that could be influenced by training, offering the patient a tangible tool in dealing with their anxiety and mood during the unpredictable treatment process. This research confirmed a negative relation between mindfulness and anxiety and depressive symptoms. Including mindfulness in scientific research appeared to be of value. Golant and colleagues confirmed this hypothesis: the unpredictability of cancer treatment and the intense and long-lasting treatment process were frequently influenced by psycho-education, mental support for patients and their families, and relaxation techniques [69]. In research study it could be interesting to investigate this hypothesis in clinical practice. Mindfulness (or perhaps Acceptance and Commitment Therapy) may offer an additional intervention tool in preventing and dealing with levels of anxiety and depressive symptoms.

Based on this study and bearing in mind all its restrictions and strengths, it may be concluded that breast cancer patients and colorectal patients did not significantly differ in the anxiety and perceived depressive symptoms as observed in clinical practice. During the active treatment phase, patients showed significant increased scores of depressive symptoms and

marginal increased levels of anxiety compared to patients during the follow up phase. A mindful attitude appeared to be a potential protective variable against the development of anxiety and depressive symptoms.

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