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Visser, Anja; de Jager Meezenbroek, Eltica C.; Garssen, Bert

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Does spirituality reduce the impact of somatic symptoms on distress in cancer patients? Cross-sectional and longitudinal findings

Anja Visser^{*,1,2}, Eltica C. de Jager Meezenbroek², Bert Garssen

Helen Dowling Institute, Centre for Psycho-Oncology, Bilthoven, the Netherlands

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ABSTRACT

Rationale: When diagnosed with cancer, a patient has to cope with stressors such as pain, fatigue, and the experience of life-threat that can cause great distress. Spirituality may be a resource for coping with these problems, thereby reducing distress.

Objective: Two questionnaire studies—the first a cross-sectional (Study 1; $N = 216$) and the second a one-year longitudinal (Study 2; $N = 383$)—investigated among Dutch cancer patients whether spirituality lessens the impact of pain, fatigue, and perceived life-threat on distress.

Method: Data for Study 1 were gathered in 2006–2007 and for Study 2 in 2009–2010. Spirituality was measured with the Spiritual Attitude and Involvement List, which assesses six distinct but related aspects of spirituality. Linear regression analysis and marginal effect plots were applied.

Results: Limited evidence appeared for the hypothesis that spirituality reduces the impact of pain, fatigue, or perceived life threat on distress. Meaningfulness and acceptance might reduce a negative impact of increases in fatigue during the first year after the start of cancer treatment. In contrast, spirituality might enhance a negative impact of increases in perceived life threat.

Conclusions: Processes of appraisal might explain the findings. Experiences of meaningfulness and acceptance might help to reappraise fatigue in a less threatening way, thereby reducing distress. Conversely, appraising the cancer as life-threatening might conflict with spiritual experiences of meaning, acceptance, and awe about life. Future studies should focus on the processes by which the various aspects of spirituality influence the adjustment of cancer patients and use other outcome variables than non-specific distress. Such studies may provide further clues as to how the spirituality of patients can be harnessed to help them adjust to a serious life event such as the occurrence of cancer.

1. Introduction

Fatigue and pain are frequently reported symptoms in cancer and have a great effect on emotional functioning (Arndt et al., 2006; Henselmans et al., 2010; Kim et al., 2008; Vahdaninia et al., 2010). In addition, how threatening a patient perceives the cancer to be is (positively) associated with distress (Laubmeier et al., 2004; Lynch et al., 2008; Wootten et al., 2007). Spirituality can play an important role in coping with these experiences, thereby buffering their impact on distress. Spirituality can be defined as “one’s striving for and experience of connectedness with the essence of life” (Jager Meezenbroek et al., 2012, p. 142). It expresses itself in various experiences, attitudes, and activities, such as experiences of meaning, attitudes of compassion, or

contemplative practices. Spirituality can be expressed and experienced through religion, although not necessarily.

James and Wells (2003) suggest two mechanisms by which religion or spirituality may buffer the effect of negative experiences on mental health: appraisal and self-regulation of thoughts and attention. These authors indicate that religion or spirituality provides a “generic mental model” (p. 365) that guides the appraisal of the situation. If the schema helps to understand the situation, religion or spirituality will be positively associated with mental health. However, if it does not help find meaning, then religion or spirituality will be negatively associated with mental health, and religious or spiritual struggles may arise. Park’s (2010) more recent meaning-making coping model elaborates on this idea.

^{*} Corresponding author. University of Groningen, Faculty of Theology and Religious Studies, Oude Boteringestraat 38, 9712 GK, Groningen, the Netherlands.
E-mail address: a.visser-nieraeth@rug.nl (A. Visser).

¹ Anja Visser is now at the Faculty of Theology and Religious Studies, University of Groningen, the Netherlands.

² Anja Visser and Eltica C. de Jager Meezenbroek contributed equally to Study 1. Eltica de Jager Meezenbroek was responsible for the design of the study and data collection. Anja Visser was responsible for data analysis and reporting of results.

James and Wells also suggest that the practices (for example, prayer, yoga, and meditation) and the social support offered by religion or spirituality can help patients to self-regulate their thoughts and attention because they help to take their minds off the experience while simultaneously inducing a relaxation response. Aldwin et al. (2014) discuss several studies that support this hypothesis by showing that social support and meditation are associated with lower blood pressure and better immune functioning, indicating more relaxation. In several qualitative studies, cancer patients reported that their religious and spiritual beliefs helped them to make sense of their situation (appraisal) and to take their mind off their worries (self-regulation), but they felt that the process of finding meaning could be a difficult and distressing process (Garssen et al., 2015a; Logan et al., 2006; Molzahn et al., 2012; Thomas and Retsas, 1999; Tuls Halstead and Hull, 2001). Coyle and Atkinson (2018) also discuss how a (temporary) lack of meaning, or a sense of hopelessness, can actually be an important process for patients that should not be negated.

Garssen et al.'s (2015a) recent systematic review found 25 studies evaluating the buffering effect of spirituality. Only six studies included people with a physical illness, and none included cancer patients. The review showed that 14 of the 25 studies (56%) found a buffering role of spirituality in the relationship between negative conditions and emotional well-being or distress. This effect was found somewhat more often if the participants had physical health problems (present in 67% of the studies) compared to population samples or students (57% and 40%, respectively). Spirituality was assessed in these studies as using prayer for help, religious salience/importance, church attendance, and a sense of peace and meaning.

Besides knowing whether spirituality plays a moderating role, it is also important to understand the timeframe in which this takes place. In the review of Garssen et al. (2015b) an effect was found among 60% (9 of 15) of the cross-sectional studies and among 50% (6 of 12) of the longitudinal studies. Two studies investigated both effects and obtained contradictory findings: Krause (2007) found a cross-sectional buffering effect of meaning in life on the relationship between stressful life events and depression; yet, this effect was not present when evaluated as a 3-year longitudinal association. In contrast, Wink et al. (2005) found both a cross-sectional effect and a 15-year longitudinal buffering effect of religiousness on the relationship between physical health and depression.

The studies discussed above suggest that spirituality potentially reduces the impact of the cancer-related stressors fatigue, pain, and perceived life threat on distress through processes of appraisal and self-regulation; yet, this possibility has never been investigated. It is also currently unclear what the timeframe of any such buffering effect of spirituality might be. Therefore, we examined on both a cross-sectional and longitudinal basis, whether several distinct aspects of spirituality reduce the impact of pain, fatigue, and the experience of life-threat in cancer patients. Six aspects of spirituality were distinguished that relate to the two pathways proposed by James and Wells (2003): *Meaningfulness*, *Acceptance*, and *Caring for Others* form general attitudes toward life that might guide situational appraisals; *Connectedness with Nature*, *Transcendent Experiences*, and *Spiritual Activities* reflect practices and experiences that might have a self-regulatory effect (the following section expands on these aspects).

2. Method

2.1. Study 1

In this study, the moderating role of various aspects of spirituality on the relationship of pain and fatigue with distress was investigated in a cross-sectional design.

Participants. Participants were recruited at seven Dutch hospitals located close to or in the city of Utrecht. Inclusion criteria were being 18 years of age or older, being Dutch-speaking, and having been

Table 1

Demographic and medical characteristics of the cancer patients.

	Study 1 (N = 216)	Study 2 (N = 444)
Mean age in years (SD)	59 (12.1)	59 (10.6)
Range	25–86	24–83
Gender (% female)	78	73
Having a partner (% yes)	81	80
Education (%)		
Primary school	12	4
Lower vocational education	20	15
High school	8	12
Secondary vocational education	13	29
University of applied sciences	38	28
University	9	12
Member of religious community (% yes)	68	62
Religious person? (%)		
Yes	54	53
No	41	42
Unsure	5	5
Spiritual person? (%)		
Yes	53	50
No	36	42
Unsure	11	8
Type of cancer (%)		
Breast	62	62
Colorectal	14	18
Lymph nodes	6	–
Gynecological	5	3
Lung	4	2
Prostate	3	12
Other	6	3
Mean time since diagnosis in months (SD)	30 (40)	3 (2.6)

diagnosed with cancer more than two months before assessment. Researchers approached a total of 415 patients who were eligible for inclusion. Of these, 219 patients agreed to participate (response rate: 53%). Three of these patients were removed due to missing data. The final sample consisted of 216 patients. Each patient's physician noted whether the patient was treated with curative or palliative intent. From these assessments, it was found that 152 participants were treated with curative intent, and 64 participants were treated with palliative intent. The socio-demographic and medical characteristics of the participants appear in Table 1.

2.2. Questionnaires

Fatigue. Fatigue was measured with the Dutch 4-item version of the Checklist Individual Strength (Alberts et al., 1997). Participants were asked to rate whether they felt tired, were easily tired, felt well, and felt physically exhausted on a 7-point scale ranging from “Yes, that is true” to “No, that is not true.” The item “I feel well” was reverse scored. Norm data for this scale are available on several healthy and patient populations, including cancer patients (Alberts et al., 1997). This shortened version is closely related to the often used, valid, and reliable longer version of the Checklist Individual Strength (CIS; Vercoulen et al., 1994).

Pain. Pain was assessed with a visual analogue scale ranging from 1 “no pain at all” to 7 “the worst pain imaginable.”

Spirituality. The Spiritual Attitude and Involvement List (SAIL) was used to measure spirituality (Jager Meezenbroek et al., 2012). The SAIL consists of seven distinctive subscales; however, the subscale Trust was not used because it has questionable construct validity (Visser et al., 2017). The items of the subscales *Meaningfulness*, *Acceptance*, *Caring for Others*, and *Connectedness with Nature* were rated on a 6-point scale ranging from 1 “not at all” to 6 “to a very high degree.” The subscales *Transcendent Experiences* and *Spiritual Activities* were rated from 1 “never” to 6 “very often.” Mean scores were calculated for all subscales, with higher scores representing more spiritual involvement.

The subscale *Meaningfulness* (3 items) measured the person's sense of meaning and purpose in life (for example, "I experience the things I do as meaningful."). The subscale *Acceptance* (4 items) measured whether the person can accept life as it unfolds (for example, "I am aware that each life has its own tragedy."). *Caring for Others* (4 items) assessed the person's need to be available to others (for example, "I try to make a meaningful contribution to society."). *Connectedness with Nature* (2 items) measured the person's experience of nature (for example, "The beauty of nature moves me."). *Transcendent Experiences* (5 items) assessed whether the person has ever had such an experience (for example, "I have had experiences in which all things seemed to be part of a greater whole."). Finally, *Spiritual Activities* contains three items that assess the person's involvement in spiritual activities [e.g., "I talk about spiritual themes with others (themes such as the meaning in life, death or religion)."] and one item that asks whether the person feels that there is a God or higher power in his/her life that gives him/her guidance.

Distress. The Dutch version of the Hospital Anxiety and Depression Scale (HADS; [Spinhoven et al., 1997](#)) was used to measure non-specific distress. This widely used 14-item questionnaire consists of two subscales measuring depression and anxiety, respectively. Previous studies have indicated that spirituality is similarly associated with the two subscales of the HADS and its total score ([McCoubrie and Davies, 2006](#); [Noguchi et al., 2004](#)). Therefore, in this study, the sum score of the total HADS was used to assess distress, with higher scores representing more distress. The HADS total score has shown good validity and reliability ([Spinhoven et al., 1997](#)).

Control variables. Age, gender, educational level, having a partner, serious life events, perceived prognosis, and time since diagnosis were considered potential control variables.

Serious life events. Participants were asked whether they had ever experienced a serious life event—for example, illness other than cancer, a death, relationship problems, financial problems, the birth of a child, marriage, change of address, or retirement—and how often they had experienced such an event in their lives (1 or 2 times, 3 or 4 times, or 5 times or more, respectively).

Perceived prognosis. The perception of the prognosis was assessed by asking patients to indicate how favorable they thought their prognosis was on a 5-point scale from 1 "very favorable" to 5 "very unfavorable."

Statistical analysis. The scores on the HADS and pain scale were not normally distributed. Therefore, scores on the HADS were square-root transformed. No transformation appeared successful for the scores on the pain scale, so the pain scores were categorized into 'low' (1SD or more below the mean), 'medium' (between 1SD below and above the mean), and 'high' (1SD or more above the mean). Each category contains approximately one-third of the participants. Due to missing data on the outcome variable the analyses were based on $N = 209$.

In a preliminary step, we tested whether the curative and palliative cancer patients were comparable and could, thus, be combined in the analyses. The curative patients appeared to be younger than the palliative patients ($t = -4.18$, $p < .001$), were more often female ($t = 4.92$, $p < .001$), were evaluated closer to the time of diagnosis ($t = -2.26$, $p < .05$), and viewed their prognosis as more favorable ($F = 164.68$, $p < .001$). The two groups did not differ on educational level, having a partner, and number of serious life events. Further, the groups did not differ on the predictors (aspects of spirituality, fatigue, and pain) and the outcome variable when controlling for age, gender, time since diagnosis, and perceived prognosis in an Analysis of Covariance (ANCOVA). Therefore, it was decided that it was appropriate to combine the two samples into one group to increase power.

In order to further preserve power, only potential control variables that were related with both distress, pain, and fatigue were selected for the analyses. For this purpose, zero-order correlations were calculated. The variables having a partner and prognosis (reflecting the difference between the curative and palliative patients) appeared to be the only

variables that remained; age, gender, educational level, life events, and time since diagnosis were not related to either distress, pain, or fatigue.

Linear regression analyses were used to investigate whether spirituality moderates the effect of fatigue and pain on distress. Six analyses were conducted, one for each aspect of spirituality. We did not include all SAIL subscales in one analysis because a weak but consistent effect of one interaction term might not be demonstrated if it shares explained variance with another interaction term. An overlap in explained variance was likely, as most interaction terms that included the same aggravating condition (fatigue and pain) were significantly related. Assumptions regarding linearity and normal distribution were adequately met. Following the recommendations of [Armstrong \(2014\)](#) and [Streiner and Norman \(2011\)](#), no correction for multiple testing was applied.

Interaction coefficients in regression analysis have been shown to have limited information value ([Brambor et al., 2006](#); [Frasier, 2016](#); [Kingsley et al., 2017](#)). Interaction coefficients are tested in regression analyses to determine whether there is an effect of the independent variable on the dependent variable (a so-called marginal effect) for any pair of values of the moderating variable. However, according to simulation studies, such a marginal effect oftentimes only occurs for some of the values of the moderating variable, leading to overstating the interaction effect. On the other hand, a moderation effect can also be understated when the regression coefficient is non-significant but there is a significant marginal effect for a small, but substantial, proportion of the sample ([Kingsley et al., 2017](#)). Therefore, we also examined marginal effects plots for all interactions tested.

All regression analyses were performed using the function `lm()` in R version 3.3.2 ([R Core team, 2016](#)). The marginal effects plots were created using the `interplot()` function by [Solt and Hu \(2016\)](#).

2.3. Study 2

In this study, we used a longitudinal design to further investigate whether spirituality moderates the relationship of pain and fatigue to distress. In addition, we investigated whether spirituality moderates the influence of perceived life threat on distress.

Participants. Participants were recruited from four hospitals and two radiotherapy institutions in the Netherlands by a member of the medical staff. Patients were eligible for participation if they were 18 years of age or older, were Dutch-speaking, were treated for cancer with curative intent, were receiving surgery or radiotherapy as primary treatment for cancer, were within two months after the start of treatment, and were not diagnosed with a psychiatric disorder or a brain tumor.

About one-third of the patients who were approached for participation in the study provided written informed consent and filled out the first questionnaire (T1; $N = 460$). After six months, the participants were asked to complete the questionnaires a second time (T2), to which 408 people responded (retention rate = 89%). After another six months, the final assessment took place (T3). This third questionnaire was filled out by 383 participants (retention rate compared to T1 = 83%). The main reasons for attrition during the study were death ($N = 19$), non-response ($N = 16$), no longer feeling motivated to fill in the questionnaires ($N = 22$), having developed psychological problems ($N = 2$) and having become too ill ($N = 2$). In addition, 16 participants were removed from the study because it was unlikely that they had been treated with curative intent, leading to a baseline sample of $N = 444$. Socio-demographic and medical characteristics of the sample are presented in [Table 1](#). The proportions of participants reporting an affiliation to a denomination or none were comparable to those in the general Dutch population ([Statistics Netherlands, 2010](#)).

Questionnaires. Fatigue, serious life events, spirituality, and distress were assessed with the same instruments as in Study 1, except that the patients were now asked whether they had experienced a serious life event in the past 6 months as opposed to ever in their lives.

Pain. The symptom scale on pain from the Dutch version of the European Organization for Research and Treatment of Cancer, Quality of Life Questionnaire-C30, version 1 (EORTC-QLQ-C30; Aaronson et al., 1993), was used to assess pain. Participants were asked to rate on a four-point scale, ranging from 1 “not at all” to 4 “very much”, how much pain they had experienced during the past two weeks and whether this pain had limited them in their daily activities. In the current study, we used the average score of the two items (Fayers et al., 1999).

Perceived life threat. The Perceived Life Threat Scale (Laubmeier et al., 2004) was used, which was translated to Dutch for use in this study by the first author. This scale consists of six items with a Likert type scale ranging from 1 (indicating no threat) to 6 (indicating high threat). Participants are asked to indicate to what extent they consider the cancer life threatening, how likely they consider recurrence or further development of the tumor, how often they worry about this, how likely they consider it that they will die from the cancer, how serious they consider their cancer to be, and how long they expect to live.

Control variables. The potential control variables in this study were age, gender, having a partner, having children, the number of children, educational level, having a paid job, type of cancer, time since diagnosis, the presence of metastases, still being in treatment at T2 or T3, time since the end of treatment, type of treatment, comorbidity, type of medication used (pain, sleep, anti-anxiety, anti-depressant, other), type of psychological help received (pastoral care worker, social worker, psychologist, complementary or alternative care, other), and having experienced a serious life event other than cancer during the previous six months.

Statistical analyses. All variables were approximately normally distributed, so no transformations were applied. As in Study 1, linear regression analyses and marginal effects plots were used to investigate the moderation effect of spirituality on the relationships of fatigue, pain, and perceived life threat with distress. The dependent variable was the change in distress in the intervals from T1 to T2 and from T2 to T3. The independent variables were the change in pain, in fatigue, and in perceived life threat in the intervals from T1 to T2 and from T2 to T3. In order to preserve power, only socio-demographic and medical control variables that were related with the dependent or independent variables at $r \geq 0.20$ were selected for the analyses (see Supplementary Table A for all correlation coefficients). The cut-off of 0.20 was chosen because analysis by Ferguson (2009) suggests that this is the minimal effect size that is practically significant. After considering the interrelations between potential control variables, the following remained: receiving radiotherapy, receiving chemotherapy, time since the end of treatment, using pain medication, and using sleep medication as assessed at either T2 or T3. The interaction variables included the interactions of change in pain, in fatigue, and in perceived life threat within the interval of T1 to T2 or T2 to T3 with each aspect of spirituality as measured at T1 or T2. These intervals were chosen because curative cancer treatment is usually completed about six months after diagnosis. After this time, the patient goes into a phase that is more focused on rehabilitation instead of survival. Thus, the two different time periods may be very different psychologically.

As in Study 1, all subscales of the SAIL were investigated separately to enhance power. Assumptions of linear regression analysis regarding linearity, homoscedasticity, and multivariate normal distribution were adequately met. No correction for multiple testing was applied. All analyses were performed using the function `lm()` in R version 3.3.2 (R Core team, 2016). The marginal effects plots were created using the `interplot()` function by Solt and Hu (2016).

3. Results

Table 2 displays mean values and ranges for all measures.

Table 2
Mean values and ranges of study variables.

	Possible range	Mean (SD) Study 1	Mean (SD) Study 2
Prognosis	1–5	2.2 (1.2)	
Life threat	9–34		15.0 (6.2)
Fatigue	1–7/4–28	4.0 (1.8) ^a	13.7 (6.8)
Pain	1–7/1–4	2.2 (1.3)	1.8 (0.9)
Meaningfulness	1–6	4.2 (0.7)	4.4 (0.7)
Acceptance	1–6	4.3 (0.7)	4.5 (0.7)
Caring for Others	1–6	4.4 (0.7)	4.7 (0.6)
Connectedness with Nature	1–6	4.6 (0.9)	4.7 (0.9)
Transcendent Experiences	1–6	2.5 (1.0)	2.4 (1.1)
Spiritual Activities	1–6	2.9 (1.2)	3.0 (1.3)
Distress	0–4/0–34	0.7 (1.6) ^b	9.0 (6.4)

^a Inverse square-root transformed scales.

^b Square-root transformed scale.

3.1. Study 1

The regression models explained 33%–38% of the variance in distress; relevant findings appear in Table 3. None of the interaction terms were statistically significant. For pain, the inspection of the marginal effects plots confirms the lack of an effect of pain on distress because all of the confidence intervals contained zero (see online Supplementary Figure A). For fatigue, the marginal effects plots indicate a statistically significant effect of fatigue on distress (see Fig. 1). This effect seems to become weaker with increasing values of *Acceptance*, *Connectedness with Nature*, *Transcendent Experiences*, and *Spiritual Activities* (suggesting a buffering effect), but stronger with increasing values of *Meaningfulness* (suggesting an aggravating effect).

3.2. Study 2

T1 – T2. The regression models explained 15%–18% of the variance in distress. The *Meaningfulness* $\times$ *Change in Fatigue* and of *Caring for Others* $\times$ *Perceived Life Threat* interactions were statistically significant (see Table 4). We used the following criteria to decide whether a moderation effect was present: (a) Is there a threshold value for which the marginal effect becomes significant or non-significant? (b) Is the ratio between the proportion of participants for which the marginal effect is statistically significant and the proportion for which it is non-significant at least 1:3? And (c), does the regression line not appear flat?

Fig. 2 shows the marginal effects plots that meet these criteria (the other plots are available in Supplementary Figure B). The effect of change in pain on change in distress seems to be moderated by *Meaningfulness*, *Acceptance*, and *Caring for Others*. The strength of the marginal effect decreased with higher levels of *Meaningfulness* and *Caring for Others* (suggesting a buffering effect) but increased with higher levels of *Acceptance* (suggesting an aggravating effect). The effect of change in fatigue seemed to be moderated by *Meaningfulness* and *Acceptance*. The strength of the marginal effect decreased for higher levels of *Meaningfulness* and *Acceptance*, suggesting a buffering effect. The effect of change in perceived life threat seemed to be moderated by *Meaningfulness*, *Acceptance*, *Caring for Others*, *Connectedness with Nature*, and *Transcendent Experiences*. The strength of the marginal effect increased with higher levels on these aspects of spirituality, suggesting an aggravating effect.

T2 – T3. The regression models explained 15%–18% of the variance in distress. The interaction terms of *Meaningfulness*, *Acceptance* and *Spiritual activities* by change in fatigue and of *Caring for Others* by change in perceived life threat were statistically significant (See Table 5). The marginal effects plots that meet the criteria stated above are shown in Fig. 3 (the other plots are available in the online

Table 3
Summary of cross-sectional hierarchical regression analyses, Study 1 ($n = 202$).

	Meaningfulness			Acceptance			Caring for Others		
	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>
Having a partner ^a	−0.21	−0.52; 0.10	.189	−0.28	−0.58; 0.02	.069	−0.31	−0.628; 0.00	.051
Perceived prognosis	0.14	0.04; 0.24	.005	0.14	0.04; 0.24	.005	0.15	0.05; 0.25	.005
Pain	−0.06	−0.89; 0.77	.891	−0.16	−1.10; 0.78	.738	0.10	−0.87; 1.07	.843
Fatigue	−0.03	−0.07; 0.13	.541	0.13	0.03; 0.24	.014	0.07	−0.04; 0.17	.224
SAIL aspect	−0.50	−1.04; 0.04	.072	−0.25	−0.79; 0.29	.364	−0.17	−0.75; 0.42	.574
SAIL aspect · pain	0.05	−0.15; 0.24	.652	0.07	−0.15; 0.29	.523	0.01	−0.21; 0.23	.921
SAIL aspect · fatigue	0.01	−0.01; 0.03	.445	−0.01	−0.04; 0.01	.245	0.00	−0.02; 0.03	.869

	Connectedness with Nature			Transcendent Experiences			Spiritual Activities		
	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>
Having a partner ^a	−0.35	−0.66; −0.03	.030	−0.35	−0.66; −0.03	.031	−0.32	−0.63; −0.01	.044
Perceived prognosis	0.16	0.06; 0.26	.002	0.15	0.05; 0.26	.003	0.15	0.05; 0.26	.003
Pain	0.15	−0.66; 0.96	.714	0.07	−0.35; 0.49	.746	−.15	−0.27; 0.57	.481
Fatigue	0.10	−0.01; 0.20	.066	0.10	0.05; 0.14	< .001	0.10	0.06; 0.15	< .001
SAIL aspect	−0.02	−0.48; 0.44	.930	0.07	−0.35; 0.49	.731	0.08	−0.23; 0.39	.608
SAIL aspect · pain	−0.00	−0.18; 0.17	.970	0.03	−0.13; 0.19	.741	−0.01	−0.14; 0.13	.946
SAIL aspect · fatigue	−0.01	−0.03; 0.02	.633	−0.01	−0.03; 0.01	.313	−0.01	−0.02; 0.01	.219

^a Having a partner: 1 = no, 2 = yes.

supplements). The effect of change in pain on change in distress seems to be moderated by *Meaningfulness* and *Caring for Others*. The strength of the marginal effect seems to increase with higher levels of *Meaningfulness* (suggesting an aggravating effect) and to decrease with higher levels of *Caring for Others* (suggesting a buffering effect). No moderation effect was observed for the relationship between change in fatigue with change in distress. The effect of change in perceived life threat on change in distress seems to be moderated by *Caring for Others*, *Connectedness with Nature*, and *Transcendent Experiences*. The strength of the marginal effect seemed to increase with higher levels of these aspects of spirituality, suggesting an aggravating effect.

4. Discussion

In two studies, we examined both cross-sectionally (Study 1) and longitudinally (Study 2) whether several distinct aspects of spirituality reduce the impact of the cancer-related stressors fatigue, pain, and perceived life threat on distress in cancer patients. To our knowledge, this research is the first to investigate these questions in any population of patients. Table 6 summarizes the patterns obtained across the two studies. A moderation effect was found more often in the marginal effects plots than in the regression analyses, suggesting that the effects are small (as also evidenced by the small regression coefficients ranging up to $B = 0.26$) but present for a substantial proportion of the sample (we

Fig. 1. Study 1: Marginal effects plots of the strength of the relationship between fatigue and distress (y-axis) for the various scores on the aspects of spirituality (x-axis). Shown are 95% confidence bands around the best-fitting line for the estimated coefficients.

Table 4
Summary of longitudinal regression analyses for the interval T1-T2, Study 2 (n = 240).

	Meaningfulness			Acceptance			Caring for Others		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Chemotherapy T2 ^a	−1.16	−2.58; 0.26	.108	−1.23	−2.66; 0.20	.091	−1.20	−2.62; 0.23	.099
Radiotherapy T2 ^a	1.37	−0.08; 2.83	.064	1.36	−0.13; 2.84	.073	1.49	0.03; 2.95	.046
Pain medication T2 ^a	0.17	−1.13; 1.46	.800	0.19	−1.12; 1.49	.779	0.38	−0.93; 1.68	.569
Sleep medication T2 ^a	2.68	1.01; 4.34	.002	2.53	0.88; 4.17	.003	2.73	1.09; 4.37	.001
Time since end of treatment in months T2	0.19	−0.15; 0.53	.279	0.17	−0.17; 0.51	.332	0.18	−0.16; 0.52	.306
Change in pain	2.41	−1.82; 6.64	.263	−2.07	−6.60; 2.46	.369	5.14	−0.22; 10.49	.060
Change in fatigue	0.74	0.23; 1.26	.005	0.67	0.07; 1.26	.028	0.54	−0.18; 1.26	.138
Change in perceived life threat	−0.31	−1.07; 0.45	.428	−0.29	−1.11; 0.53	.485	−0.82	−1.73; 0.09	.077
SAIL aspect T1	0.02	−0.73; 0.76	.967	0.35	−0.41; 1.11	.368	−0.47	−1.30; 0.35	.261
SAIL aspect · change in pain	−0.36	−1.29; 0.56	.440	0.61	−0.36; 1.58	.215	−0.89	−1.98; 0.21	.112
SAIL aspect · change in fatigue	−0.13	−0.24; −0.02	.020	−0.11	−0.24; 0.01	.077	−0.09	−0.24; 0.06	.243
SAIL aspect · change in perceived life threat	0.10	−0.07; 0.27	.252	0.09	−0.09; 0.27	.314	0.20	0.01; 0.40	.043

	Connectedness with Nature			Transcendent Experiences			Spiritual Activities		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Chemotherapy T2 ^a	−1.07	−2.50; 0.36	.140	−1.30	−2.75; 0.15	.078	−1.11	−2.55; 0.33	.129
Radiotherapy T2 ^a	1.61	0.13; 3.10	.033	1.43	−0.05; 2.90	.057	1.57	0.06; 3.78	.042
Pain medication T2 ^a	0.29	−1.01; 1.60	.658	0.26	−1.05; 1.58	.694	0.24	−1.07; 1.55	.721
Sleep medication T2 ^a	2.57	0.92; 4.22	.002	2.61	0.93; 4.28	.003	2.54	0.85; 4.23	.003
Time since end of treatment in months T2	0.19	−0.15; 0.54	.274	0.14	−0.21; 0.48	.438	0.18	−0.17; 0.52	.320
Change in pain	0.22	−3.45; 3.88	.907	0.61	−1.42; 2.65	.553	1.31	−0.41; 3.02	.135
Change in fatigue	0.56	0.01; 1.10	.045	0.13	−0.09; 0.36	.251	0.15	−0.08; 0.38	.198
Change in perceived life threat	−0.31	−0.94; 0.32	.335	−0.09	−0.40; 0.22	.571	0.03	−0.29; 0.35	.867
SAIL aspect T1	−0.04	−0.61; 0.53	.893	0.31	−0.19; 0.80	.223	−0.06	−0.49; 0.36	.780
SAIL aspect · change in pain	0.12	−0.65; 0.88	.766	0.05	−0.63; 0.73	.887	−0.17	−0.63; 0.30	.482
SAIL aspect · change in fatigue	−0.09	−0.20; 0.02	.125	0.01	−0.08; 0.09	.889	−0.01	−0.07; 0.06	.877
SAIL aspect · change in perceived life threat	0.09	−0.04; 0.23	.180	0.09	−0.03; 0.21	.156	0.03	−0.07; 0.14	.530

Note. Statistically significant interaction effects at $p \leq .05$ appear in **boldface**. T1 = baseline. T2 = 6 months' assessment.

^a 0 = no, 1 = yes.

had applied the criterion that the ratio between the proportion of participants for which the marginal effect was statistically significant and the proportion for which it was non-significant needed to be at least 1:3).

The only moderation effects that were found in both the marginal effects plots (see Figs. 1–3) and the regression analyses were a buffering effect of *Meaningfulness* on the relationship between change in fatigue and change in distress in Study 2, T1-T2 and an aggravating effect of *Caring for Others* on the relationship between change in perceived life threat and change in distress in both intervals of Study 2. There is little consistency in the findings regarding other aspects of spirituality, except: (a) for a potential buffering effect of acceptance on the relationship between fatigue and distress in both the cross-sectional and the longitudinal studies; and in Study 2 (b), a potential longitudinal aggravating effect of most of the aspects of spirituality on the relationship between change in perceived life threat and change in distress. The buffering effect of *Meaningfulness* and *Acceptance* on the impact of fatigue supports James and Wells' (2003) theory that religion or spirituality influences mental health through a mechanism of situational appraisal. Experiencing life as meaningful and being able to accept that life contains both positive and negative aspects might help to reappraise symptoms of fatigue as part of the experience of cancer or of life in general and thereby not cause additional distress.

We did not anticipate finding an aggravating effect of most aspects of spirituality in relation to perceived life threat but these might be explained in a similar way. Specifically, as James and Wells (2003) proposed and Park (2010) further developed, it can cause great distress if the general beliefs offered by religion or spirituality are not sufficient to understand the situation or if there is even a contradiction between previously held beliefs and the appraisal of the current situation. Among others, such a discrepancy can involve beliefs about justice, control, and predictability, such as “God protects me from harm.” The appraisal of cancer as life-threatening may be in conflict with these

beliefs: “God does not protect me after all.” In the current study, we have not directly assessed such beliefs, but we have assessed experiences that may stem from these beliefs, including a sense of meaning, acceptance, and awe about life.

We found little evidence to support the mechanism of self-regulation proposed by James and Wells (2003). Such an effect might have appeared as an interaction between the SAIL sub-scales of *Connectedness with Nature*, *Transcendent Experiences*, or *Spiritual Activities* and the symptoms of pain or fatigue. These aspects of the SAIL reflect experiences and activities in which the person might be distracted or might experience a relaxation response. In Study 1, the marginal effect plots showed these effects, but the regression coefficients were very close to zero. In Study 2, the regression analysis, but not the marginal effects plots showed a buffering effect of *Spiritual Activities* on the relationship between change in fatigue and change in distress during the interval T2-T3, suggesting that it may have been a chance finding.

4.1. Limitations

Overall, we found little evidence that spirituality might reduce the impact of cancer-related stressors on distress. This might be explained by the choice of outcome measure. A very broad measure of distress was used, but spirituality may have a larger effect on outcomes that relate to the function of spirituality as a meaning system, such as sense of coherence, post-traumatic growth, self-esteem, or disease-specific distress (Johnson Vickberg et al., 2000; Park, 2005). Wink et al. (2005) also suggest that:

because of its association with creativity and personal growth, spirituality is more conducive than religiousness to psychological openness to negative affect resulting from personal adversity. Consequently, a narrow focus on depression may not provide a broad enough outcome measure for testing the beneficial effect of spirituality in response to adversity (p. 216).

Fig. 2. Marginal effects plots of the strength of the relationship between a change in pain, fatigue or perceived life threat and a change in distress during the first 6 months after the start of cancer treatment (y-axis) for the various scores on the aspects of spirituality (x-axis). Shown are 95% confidence bands around the best-fitting line for estimated coefficients.

In total, we have tested 54 interactions without correction for multiple testing, which could have led to chance findings. However, there is currently no knowledge on the moderating effect of spirituality on the relationships of pain and fatigue to distress. Adjustment for multiple testing would result in an increased risk of Type II errors, which would inhibit the ability of this study to generate hypotheses for future studies and, thereby, the development of our understanding of the role of spirituality in the

adjustment to cancer. In addition, marginal effects plots are less prone to inflations in Type I error, so we feel fairly confident that these reflect actual relationships. Finally, this study was conducted among white, mainly female cancer patients who had been treated with curative intent. Although this does reflect the majority of people with cancer, it does mean that our findings cannot be generalized to the population of cancer patients as a whole. Further research is needed to replicate the findings and to further understand the mechanisms behind the relationships.

Table 5
Summary of longitudinal regression analyses for the interval T2-T3, Study 2 ($n = 260$).

	Meaningfulness			Acceptance			Caring for Others		
	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>
Chemotherapy T3 ^a	0.11	−0.97; 1.18	.845	0.54	−0.53; 1.61	.321	−0.24	−1.29; 0.81	.649
Radiotherapy T3 ^a	0.16	−0.94; 1.27	.771	0.37	−0.67; 1.46	.467	0.28	−0.79; 1.34	.608
Pain medication T3 ^a	−.67	−1.74; 0.40	.218	−0.87	−1.91; 0.18	.104	−0.84	−1.89; 0.21	.115
Sleep medication T3 ^a	0.16	−1.41; 1.74	.837	0.28	−1.26; 1.82	.719	0.11	−1.44; 1.65	.892
Time since end of treatment in months T3	−0.10	−0.24; 0.05	.203	−0.06	−0.21; 0.09	.415	−0.10	−0.25; 0.04	.157
Change in pain	−1.08	−4.80; 2.63	.566	1.00	−2.92; 4.91	.616	2.78	−1.51; 5.87	.246
Change in fatigue	0.74	0.25; 1.23	.003	0.68	0.17; 1.19	.009	0.24	−0.32; 0.79	.402
Change in perceived life threat	0.09	−0.62; 0.79	.810	0.83	0.18; 1.47	.012	−1.05	−1.81; −0.30	.006
SAIL aspect T2	0.27	−0.37; 0.91	.403	0.52	−0.15; 1.18	.126	0.03	−0.60; 0.66	.925
SAIL aspect · change in pain	0.42	−0.46; 1.30	.345	−0.08	−0.94; 0.78	.850	−0.32	−1.11; 0.48	.432
SAIL aspect · change in fatigue	−0.13	−0.24; −0.02	.019	−0.11	−0.22; −0.00	.044	−0.02	−0.13; 0.10	.769
SAIL aspect · change in perceived life threat	0.03	−0.13; 0.19	.705	−0.14	−0.29; 0.00	.053	0.26	0.11; 0.42	.001

	Connectedness with Nature			Transcendent Experiences			Spiritual Activities		
	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>
Chemotherapy T3 ^a	−0.10	−1.17; 0.97	.854	0.13	−0.93; 1.19	.806	0.17	−0.88; 1.21	.755
Radiotherapy T3 ^a	0.27	−0.82; 1.36	.624	0.43	−0.67; 1.53	.441	0.29	−0.77; 1.35	.590
Pain medication T3 ^a	−0.84	−1.91; 0.23	.124	−0.74	−1.83; 0.34	.179	−0.7	−1.78; 0.32	.170
Sleep medication T3 ^a	0.28	−1.30; 1.86	.726	0.31	−1.27; 1.89	.699	0.50	−1.05; 2.06	.526
Time since end of treatment in months T3	−0.10	−0.24; 0.05	.203	−0.07	−0.22; 0.08	.364	−0.09	−0.24; 0.05	.206
Change in pain	0.89	−1.70; 3.48	.498	0.67	−0.89; 2.24	.398	0.58	−0.78; 1.93	.402
Change in fatigue	0.42	−0.04; 0.87	.072	0.28	0.06; 0.50	.013	0.51	0.31; 0.72	< .001
Change in perceived life threat	−0.20	−0.80; 0.40	.517	−0.06	−0.36; 0.23	.673	0.15	−0.12; 0.43	.278
SAIL aspect T2	0.06	−0.45; 0.57	.815	−0.07	−0.48; 0.34	.738	−0.14	−0.49; 0.21	.445
SAIL aspect · change in pain	−0.05	−0.60; 0.50	.861	0.01	−0.56; 0.57	.976	0.04	−0.35; 0.44	.823
SAIL aspect · change in fatigue	−0.05	−0.15; 0.04	.272	−0.04	−0.12; 0.03	.255	−0.10	−0.16; −0.05	< .001
SAIL aspect · change in perceived life threat	0.08	−0.04; 0.21	.190	0.11	−0.01; 0.23	.063	0.03	−0.06; .011	.576

Note. Statistically significant interaction effects at $p \leq .05$ appear in **boldface**. T2 = 6 months' assessment. T3 = 12 months' assessment.

^a 0 = no, 1 = yes.

Fig. 3. Marginal effects plots of the strength of the relationship between a change in pain, fatigue or perceived life threat and a change in distress during the months 6–12 after the start of cancer treatment (y-axis) for the various scores on the aspects of spirituality (x-axes). Shown are 95% confidence bands around the best-fitting line for estimated coefficients.

Table 6
Summary of the findings.

	Pain			Fatigue			Perceived Life Threat	
	Study 1	Study 2, T1-T2	Study 2, T2-T3	Study 1	Study 2, T1-T2	Study 2, T2-T3	Study 2,T1-T2	Study 2,T2-T3
Meaningfulness	ns	– *	+ *	+ *	– * ^	– ^	+ *	ns
Acceptance	ns	+ *	ns	– *	– *	– ^	+ *	ns
Caring for Others	ns	– *	– *	ns	ns	ns	+ * ^	+ * ^
Connectedness with Nature	ns	ns	ns	– *	ns	ns	+ *	+ *
Transcendent Experiences	ns	ns	ns	– *	ns	ns	+ *	+ *
Spiritual Activities	ns	ns	ns	– *	ns	– ^	ns	ns

Note. + = aggravating effect; – = buffering effect; * = effect found in marginal effects plots; ^ = effect found in regression analyses; ns = non-significant. T2 = 6 months' assessment. T3 = 12 months' assessment.

5. Conclusions

The current research found limited evidence for the hypothesis that spirituality reduces the negative impact of pain, fatigue, or perceived life threat on distress among cancer patients. The findings suggest that meaningfulness and acceptance might reduce a negative impact of increases in fatigue during the first year after the start of cancer treatment. In contrast, spirituality might enhance a negative impact of increases in perceived life threat, particularly during the first 6 months after the start of cancer treatment. Processes of situational appraisal may play a role. Future studies on the role of spirituality in adjustment to cancer should consider the use of other outcome variables than non-specific distress. Such studies may provide further clues on how the spirituality of patients can be harnessed to help them adjust to a serious life event, such as the occurrence of cancer.

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Ethical approval

Study 1 was approved by the Ethical Review Committee of the St. Antonius hospital, Nieuwegein, the Netherlands. Study 2 was approved by the Ethical Review Committee of the University Medical Centre Utrecht, Utrecht, the Netherlands.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.socscimed.2018.08.012>.

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