



# Positive mental health among cancer survivors: overlap in psychological well-being, personal meaning, and posttraumatic growth

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## Abstract

**Purpose** Positive mental health involves theoretical constructs like psychological well-being, personal meaning, and posttraumatic growth. This study aims to provide empirical insight into possible overlap between these constructs in cancer survivors.

**Methods** Within the context of a randomized controlled trial, 170 cancer survivors completed the patient-reported outcome measures (PROMs) Ryff's Scales of Psychological Well-Being (SPWB), Personal Meaning Profile (PMP), and Posttraumatic Growth Inventory (PTGI). Exploratory factor analysis (EFA) on the subscales of these PROMs, as well as structural equation modeling (SEM), was used to explore overlap in these three constructs.

**Results** The EFA resulted in a three-factor solution with an insufficient model fit. SEM led to a model with a high estimated correlation (0.87) between SPWB and PMP and lower estimated correlations with PTGI (respectively 0.38 and 0.47). Furthermore, the estimated correlation between the subscales relation with God (PMP) and spiritual change (PTGI) was high (0.92). This model had adequate fit indices ( $\chi^2(93) = 144, p = .001, RMSEA = 0.059, CFI = 0.965, TLI = 0.955, SRMR = 0.061$ ).

**Conclusions** The constructs psychological well-being and personal meaning overlap to a large extent in cancer survivors. Posttraumatic growth can be seen as a separate construct, as well as religiosity. These findings facilitate researchers to select the appropriate PROM(s) when testing the effect of a psychosocial intervention on positive mental health in cancer survivors.

**Relevance** An increasing number of psychosocial intervention trials for cancer survivors use positive mental health outcomes. These constructs are often multifaceted and overlapping. Knowledge of this overlap is important in designing trials, in order to avoid the pitfalls of multiple testing and finding artificially strengthened associations.

**Netherlands Trial Register** NTR3571

**Keywords** Cancer · Mental health · Oncology · Patient-reported outcome measures · Survivors · Meaning

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## Background

Patient-reported outcome measures (PROMs) in psychosocial intervention trials targeting cancer survivors generally focus on psychological distress and quality of life [1]. However, absence of distress does not necessarily lead to positive mental health [2, 3]. Positive mental health involves factors such as psychological well-being [4], experiencing a sense of meaning in life [5], posttraumatic growth [6], self-compassion [7], and flourishing [8]. Evidence on the importance of positive mental health for a successful adjustment to life after cancer is growing [9–11]. Studies show that positive mental health protects cancer survivors against distress and demoralization [12] and that it plays a role in mental recovery after the treatment phase [13].

In the field of positive mental health research, constructs are often not clearly demarcated from each other, which can be

observed in their often extensive descriptions [5, 14, 15]. Although the theories of constructs like psychological well-being [16], meaning in life [5, 17], and posttraumatic growth [18] are rooted in different research traditions, the multifaceted descriptions of these constructs tend to overlap considerably. This hinders their operationalization into adequately distinguishable constructs, which is imperative for carrying out rigorous randomized controlled trials (RCTs) investigating the effects of interventions that aim to improve positive mental health in cancer survivors.

Not surprisingly, the overlap between psychological well-being, meaning, and posttraumatic growth is reflected in medium to strong correlations between these constructs in cancer survivors [11, 19, 20], although correlations with posttraumatic growth tend to be lower [11, 21–24]. Furthermore, the overlap is noticeable when these constructs are operationalized into measurement instruments. Three frequently used PROMs in psycho-oncology (Ryff's Scales of Psychological Well-Being (SPWB) [16], the Personal Meaning Profile (PMP) [17], and the Posttraumatic Growth Inventory (PTGI) [25]) were recently used in a randomized controlled trial (RCT) on the efficacy of meaning-centered group psychotherapy (MCGP) for cancer survivors [26]. All three measurement instruments contain a subscale on relations with other people. Overlap between the measures of psychological well-being and personal meaning can further be found in the areas of pursuing worthwhile goals, having a sense of mastery or dedication, and a sense of being at peace with oneself. Posttraumatic growth by definition comprehends positive psychological *change* in response to an adverse event, in contrast to psychological well-being and personal meaning. Yet, the measurement instrument of posttraumatic growth has overlap with the measurement instruments of psychological well-being and meaning in all its facets, including growth, finding new possibilities in life, and spirituality. An overview of the overlap between these measurement instruments is displayed in Table 1.

As a result of the overlap between these instruments, it is difficult to gain insight into what exactly is affected by interventions that aim to improve positive mental health. Furthermore, the question rises which (subscales of) instruments are suited best to be used as primary outcome measure in RCTs investigating these interventions. Therefore, the aim of the present study was to investigate empirically the overlap between measurement instruments of psychological well-being, personal meaning, and posttraumatic growth among cancer survivors. Factor analysis was conducted on the subscales of the Dutch versions of these well-validated PROMs (i.e., SPWB, PMP, and PTGI), as filled out in the context of the RCT evaluating MCGP [26]. It was presumed that factor analysis would not result in three separate factors representing psychological well-being, personal meaning, and posttraumatic growth. It was expected that a different factor structure

would appear, crossing through these measurement instruments and revealing areas of overlap. The results will contribute to better understanding of the overlap of these positive mental health constructs, which is highly needed to develop core outcome sets to measure cancer survivors' positive mental health in the future.

## Methods

### Patients

For this study, baseline data were used from an RCT on the efficacy of MCGP for cancer survivors [26]. Ethical approval for this study was provided by the Medical Ethical Committee of Leiden University Medical Center (NL34814.058.10). Information about the study protocol, participants, and primary outcomes has been published previously [26, 27].

Participants were recruited between August 2012 and September 2014. Inclusion criteria were as follows: cancer diagnosis in the last 5 years, treated with curative intent, main treatment completed (i.e., surgery, radiotherapy, chemotherapy), presence of an expressed need for psychological support, and at least one psychosocial complaint. Exclusion criteria were as follows: severe cognitive impairment, current psychological or psychiatric treatment elsewhere, and an insufficient mastery of the Dutch language. All criteria were ascertained during a telephonic screening interview.

Informed consent was obtained from all individual participants included in the study. Demographic characteristics were obtained by self-report: age, gender, marital status, education level, employment, religious background, other negative life events, and past psychological treatment. Illness-related characteristics included type of cancer, tumor stage, type of treatment, and time since treatment and were retrieved from medical records or by self-report, if medical records were unavailable.

### Outcome measures

Psychological well-being was measured using the Dutch version of the SPWB [28]. This is a 39-item measure consisting of six subscales: self-acceptance ( $\alpha = 0.81$ ), positive relations with others ( $\alpha = 0.83$ ), autonomy ( $\alpha = 0.84$ ), environmental mastery ( $\alpha = 0.76$ ), purpose in life ( $\alpha = 0.79$ ), and personal growth ( $\alpha = 0.071$ ). Items were answered on a 6-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree). Subscale scores were calculated as the mean item score. Higher scores indicated greater well-being. The Dutch version has the same six subscales as the original version, although several items had to be removed to reach adequate fit. The Dutch version showed sufficient internal consistency and good construct validity [28].

**Table 1** Overview of overlap between measures of psychological well-being, personal meaning and posttraumatic growth

Measure	Scales of Psychological Well-Being (SPWB)	Personal Meaning Profile (PMP)	Posttraumatic Growth (PTGI)
Subscale	Purpose in life	Goal-orientedness	Appreciation of life
Description	Goals and purpose in life, directedness, meaning to present and past life, aims and objectives for living.	Life goals, worthwhile objectives, valuable pursuits, purpose, meaning and direction in life, actualize his/her potentials.	Priorities in life, appreciation for his/her own life, appreciates each day.
	Environmental mastery	Dedication to life	Personal Strength
	Mastery and competence in managing the environment, complex array of external activities, effective use of opportunities, creates contexts suitable to personal needs and values.	Contributes to well-being of others, values and is committed to his/her work, contribution to society, initiatives, likes challenges, persistent and resourceful, makes full sense of his/her abilities, personal growth, does not give up, altruistic and helpful.	Self-reliance, knows he/she can handle difficulties, accepts the way things work out, discovered that he/she is stronger than he/she thought he/she was.
	Personal growth		New possibilities
	Continued development, growing and expanding, open to experiences, sense of realizing his/her potential, improvement in self and behavior, changing in ways that reflect more self-knowledge and effectiveness.		New interests, new path for life, does better things with his/her life, new opportunities which would not have been available otherwise, changes things which need changing.
	Self-acceptance	Fairness of life	
	Positive attitude toward the self, acknowledges and accepts multiple good and bad aspects of self, positive about past life.	Treated fairly by life and others, at peace with past self, accepts his/her limitations, receives fair share of opportunities and rewards, justice in this world, accepts what cannot be changed, at peace with him/her self.	
	Autonomy		
	Self-determined, independent, resists social pressures, regulates behavior from within, evaluates self by personal standards.		
	Positive relations	Relation with other people	Relating to others
	Warm, satisfying, trusting relationships, concerned about others; capable of strong empathy, affection and intimacy, understands give and take of human relationships.	Mutually satisfying relationship, found someone he/she loves deeply, someone to share intimate feelings with, good family life, confidants to give him/her emotional support, relates well to others.	Counts on people, closeness with others, willing to express his/her emotions, compassion, putting efforts in relationships, learned about how wonderful people are, accepts needing others.
		Relation with God/higher order	Spiritual change
		In peace with God, believes in afterlife, seeks to do God's will and glorifies God, personal relationship with God, sense of mission or calling, order and purpose in the universe, seeks higher values.	Understanding of spiritual matters, a stronger religious faith.

The Dutch version of the PMP was used to measure personal meaning [17, 29]. This 39-item measure has five subscales: dedication to life ( $\alpha = 0.89$ ), fairness of life ( $\alpha = 0.77$ ), goal-orientedness ( $\alpha = 0.89$ ), relations with other people ( $\alpha = 0.85$ ), and relation with God ( $\alpha = 0.86$ ). Items

were scored on a 7-point Likert scale from 1 (not at all) to 7 (a great deal). A higher score reflects a more important source of meaning. This measure was validated in Dutch cancer patients and showed good internal consistency and construct validity. Its number of items and factor structure differed from

the original Canadian version. Of the originally 57 items, 18 had to be removed in the Dutch version, because of low or double loadings and the original factors “relations” and “intimacy” formed one factor in the Dutch version, as well as “fair treatment” and “self-acceptance” [29].

Posttraumatic growth was measured using the Dutch translation of the PTGI [25, 30]. This 21-item measure has five subscales: relating to others ( $\alpha = 0.85$ ), new possibilities ( $\alpha = 0.80$ ), personal strength ( $\alpha = 0.79$ ), spiritual change ( $\alpha = 0.70$ ), and appreciation of life ( $\alpha = 0.75$ ). Items were rated from 0 (not at all) to 5 (very great degree). Subscale scores were calculated as mean item scores and a higher score suggests stronger growth. A psychometric study of the PTGI in Dutch cancer patients showed good internal consistency, construct validity, and factorial validity. The Dutch version contains the same factors as the original version [30].

## Statistical methods

Exploratory maximum likelihood factor analysis (EFA) with varimax rotation on all subscales of the SPWB, PMP, and PTGI was conducted to explore possible areas of overlap between psychological well-being, personal meaning, and post-traumatic growth. The number of factors to retain was based on the eigenvalues ( $> 1.0$ ), the slope of the scree plot and parallel analysis. To assess the goodness-of-fit of the resulting model, this model was entered into a confirmatory maximum likelihood factor analysis (CFA) using the same sample. The following goodness-of-fit indices and thresholds were used: the  $\chi^2$ -test ( $p < 0.05$ ), the root mean square error of approximation (RMSEA,  $< 0.06$ ), the comparative fit index (CFI,  $\geq 0.90$ ), the Tucker-Lewis index (TLI,  $\geq 0.90$ ), and the standardized root mean square (SRMS,  $< 0.08$ ). Missing data were presumed to be missing completely at random (MCAR).

When the model resulting from the EFA would not show adequate fit, two additional models would be considered. (1) In order to compare the result of the EFA with the null model (i.e., a model in which the subscales load on a factor that represents their own measurement instrument, revealing no areas of overlap), the goodness-of-fit indices would be calculated for this null model, as well, using CFA. (2) In order to explore the overlap between the SPWB, PMP, and PTGI further, structural equation modeling (SEM) would be used. Beginning with the null model, in which each measurement instrument formed a latent variable, represented by its subscales as manifest variables, the path with the highest modification index would be added to the model and the goodness-of-fit indices would be re-calculated. This procedure would be repeated until the model had an adequate fit. Correlations in the models were considered as low ( $< 0.5$ ), moderate ( $\geq 0.5$  and  $< 0.7$ ), or high ( $\geq 0.7$ ). All analyses were performed in IBM SPSS Statistics 24 or R 3.4.0, package Lavaan.

## Results

### Participant characteristics

In total, 2192 cancer survivors received an invitation letter for this study, 419 survivors responded positively, 184 met all inclusion criteria, and 170 completed the outcome measures at baseline. Participants were on average 57 years old and 82% was female. Eighty percent was married or in a relationship,

**Table 2** Participant characteristics ( $N = 170$ )

	<i>N</i>	%	<i>M</i>	<i>SD</i>	Median	Range
Age (M, SD, range)			57	10		
Gender (female)	140	82				
Marital status (single)	34	20				
Education level						
Low	23	13				
Medium	81	48				
High	66	39				
Employment (yes) <sup>a</sup>	88	53				
Religion						
Christian	85	50				
No religion	85	50				
Type of cancer						
Breast	112	66				
Colon	37	22				
Other (esophagus, stomach, pancreatic, lung, endometrial, ovarian, melanoma, lymphoma)	21	12				
Tumor stage						
0 (in situ)	10	6				
I	57	34				
II	51	30				
III	28	16				
IV	3	2				
Missing	21	12				
Type of treatment						
Surgery	169	99				
Surgery combined with radiation and/or chemotherapy	138	81				
Months since treatment (Mdn, range) <sup>b</sup>					18	3–58
Negative life event in last 2 years (other than cancer)	90	53				
Previous psychological treatment <sup>c</sup>						
< 1 year ago	30	18				
> 1 year ago	59	35				
Never	79	47				

<sup>a</sup>  $N = 165$

<sup>b</sup>  $N = 159$

<sup>c</sup>  $N = 168$

39% was higher educated, and 53% was employed. Breast cancer was diagnosed in 66% of the participants; 70% had tumor stage II or lower. All participants but one had surgery and 81% had additional radiation or chemotherapy. Participants were median 18 months post treatment. Other negative life events were reported by 53% of the participants, and 18% had psychological treatment in the last year (Table 2). More details on the participant flow and dropout can be found elsewhere [26].

### Exploratory factor analysis

Based on the scree plot and the eigenvalues, three factors should be extracted. The parallel analysis, however, indicated a solution of two factors. The eigenvalue of the third factor (1.355) was below the parallel analysis eigenvalue at the 95th percentile (1.420). However, it was higher than the average parallel analysis eigenvalue of the third factor (1.347). Because both the scree plot and the eigenvalues indicated a three-factor solution, and the parallel analysis “almost” indicated a three-factor solution, this solution was retained (Table 3; see Online Resources 1 and 2 for descriptive statistics of the PROMs and a graphical representation of these factors). The three-factor solution explained 59% of the variance. The first factor consisted of all SPWB and PMP subscales, except the PMP subscale relation with God. The second factor consisted of all PTGI subscales, except spiritual change. The third factor consisted of the subscales relation with God (PMP) and spiritual change (PTGI). The goodness-of-fit indices of this three-factor solution were

unsatisfactory ( $\chi^2(101) = 314$ ,  $p < .001$ , RMSEA = 0.115 (95% CI 0.100–0.129), CFI = 0.854, TLI = 0.827, SRMR = 0.085), meaning that the model did not fit well with the data.

### Additional analyses

Since the above described three-factor solution did not have an adequate fit, the question arose whether a model in which each measurement instrument formed a separate factor (null model) would better fit with the data. The results of this CFA showed that the goodness-of-fit indices of the null model were slightly worse ( $\chi^2(101) = 357$ ,  $p < .001$ , RMSEA = 0.126 (95% CI 0.112–0.140), CFI = 0.825, TLI = 0.792, SRMR = 0.094).

When pathways were subsequently added to the null model using SEM, based on the modification indices, the fit improved ( $\chi^2(93) = 144$ ,  $p = .001$ , RMSEA = 0.059 (95% CI 0.039–0.077), CFI = 0.965, TLI = 0.955, SRMR = 0.061). In the resulting model, the latent variables SPWB and PMP had an estimated correlation of 0.87, SPWB and PTGI of 0.38, and PMP and PTGI of 0.47 (Fig. 1). Furthermore, a path was added between the subscales relation with God (PMP) and spiritual change (PTGI) and between spiritual change (PTGI) and personal growth (SPWB). The subscale positive relations with others (SPWB) formed paths with relations with other people (PMP), relating to others (PTGI), and personal growth (SPWB). The subscale personal growth (SPWB) also loaded on the PTGI. The subscale relation with God (PMP) loaded negatively on the SPWB, as well. Finally, a negative pathway had to be added between the SPWB subscales autonomy and purpose in life. Since the fit of this model was adequate, it was considered as the main outcome of this study.

**Table 3** Rotated (varimax) component matrix

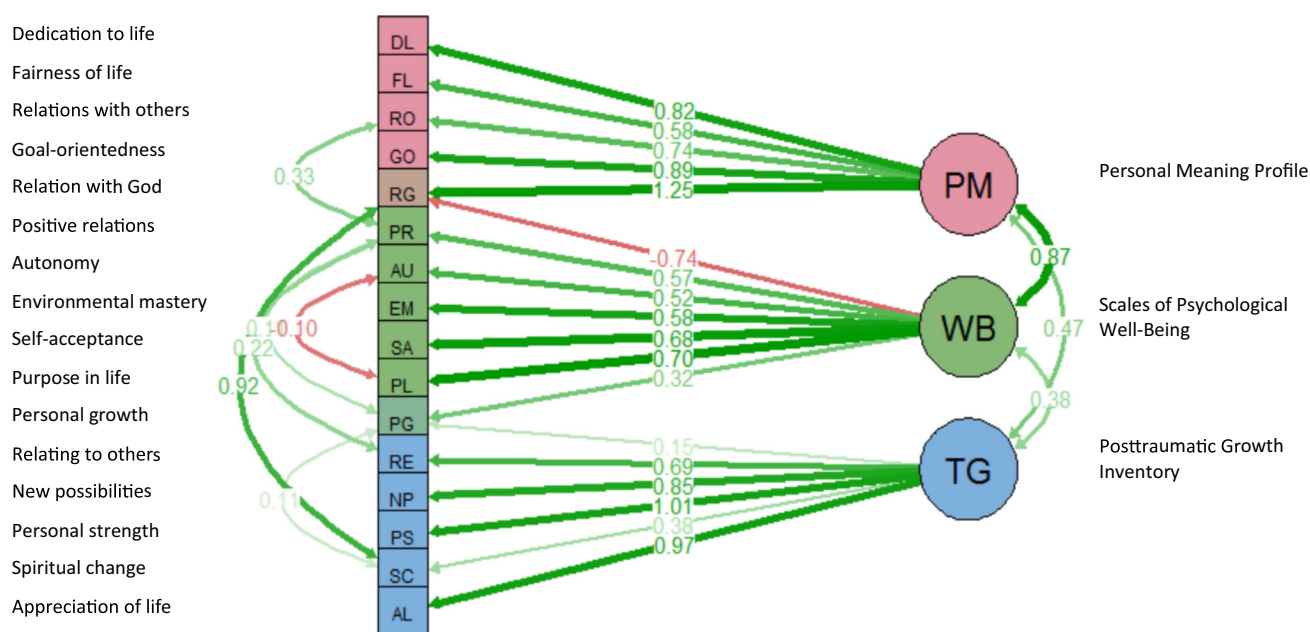
Subscales	Measurement Instrument	Loadings		
		1	2	3
Self-acceptance	SPWB	0.85		
Purpose in life	SPWB	0.85		
Environmental mastery	SPWB	0.82		
Dedication to life	PMP	0.74		
Goal-orientedness	PMP	0.69		0.32
Positive relations	SPWB	0.63		
Autonomy	SPWB	0.61		
Fairness of life	PMP	0.61		
Relation with other people	PMP	0.57		
Personal growth	SPWB	0.53	0.35	
Personal strength	PTGI		0.83	
Appreciation of life	PTGI		0.77	
New possibilities	PTGI		0.73	
Relating to others	PTGI		0.67	
Relation with God	PMP			0.98
Spiritual change	PTGI		0.32	0.63

Factor loadings < 0.30 are suppressed

$N = 161$

### Conclusions

The empirical baseline data of cancer survivors participating in an RCT supported the expectation that measurement instruments of psychological well-being, personal meaning, and posttraumatic growth do share areas of overlap. The resulting model was complex, but three main conclusions can be drawn. (1) The scores on psychological well-being (SPWB) and personal meaning (PMP) were highly correlated (as latent variables), which suggests that both PROMs measure similar or very closely related aspects of positive mental health. (2) Their estimated correlation with the posttraumatic growth measure (PTGI), as latent variable, was lower, suggesting that posttraumatic growth is a related, but distinct construct. (3) A high estimated correlation was found between the subscales relation with God (PMP) and spiritual change (PTGI), while their loadings on their respective measurement instruments deviated from the other subscale loadings. This supports the idea that religiosity is distinct from psychological well-being, personal meaning, and posttraumatic growth.



**Fig. 1** Model resulting from adding pathways to the null model in which each measurement instrument formed a latent variable, represented by its subscales as manifest variables. Note.  $N = 161$ . This figure was created using the R package Lavaan

These results have clear implications for the use of the SPWB, PMP, and PTGI in trials that investigate the effect of psychosocial interventions targeting cancer survivors. The overlap implies that if an intervention aims to improve both psychological well-being and personal meaning, in fact, the same phenomena or behaviors, feelings, cognitions, goals and convictions may have changed. Measuring these constructs separately means that these specific phenomena are measured double [33]. Previous studies showed similar results in the operationalization of spirituality and well-being [31, 32]. It may be more efficient and less burdensome for cancer survivors to measure these phenomena just once.

In addition, taking this overlap into account may help to avoid various pitfalls in designing a trial. The overlap between these measures will artificially increase the strength of their association [31], so one may wrongly conclude that personal meaning *leads to* psychological well-being or vice versa. Furthermore, measuring both constructs increases the problem of multiple testing, because the same phenomena are measured more often. Further psychometric research is needed to select those items from the SPWB and PMP that measure these overlapping phenomena in the most parsimonious way with the largest sensitivity for change.

The results of this study do not mean that psychological well-being and meaning are entirely exchangeable concepts. Their connotations are different [15], these concepts are rooted in different literary and research traditions, and their measures will not invariably give similar outcomes. What this study does show, however, is that when it comes to operationalization, these constructs

overlap in many ways. Better insight into cancer survivors' positive mental health is served by acknowledging this overlap.

Despite the conceptual overlap between posttraumatic growth, psychological well-being, and personal meaning, the results of this study suggest that mainly psychological well-being and personal meaning overlap, while posttraumatic growth falls farther outside. This is in agreement with several studies that did not find a significant association between posttraumatic growth and well-being [18, 34]. An alternative explanation for this outcome is that the PTGI requires a different type of item response than the SPWB and PMP. Survivors are not asked to rate how they feel at the moment, but how their feelings differ from before cancer. Scales with a different type of item response may artificially influence SEM results.

Finally, the results support the idea that religiosity can be seen as distinct from psychological well-being, personal meaning, and posttraumatic growth. Perhaps, especially in a secular country like The Netherlands, there is a large variability in the role religion plays in people's lives, ranging from absent to prominent and from negative to positive. This finding is in line with previous studies in The Netherlands [28], as well as in the USA [35]. Hence, it seems that religiosity is a domain that should be measured separately in cancer survivors.

This study had several limitations. First, the number of participants was relatively small, females and breast cancer survivors were overrepresented, and all analyses were

conducted using the same sample. Second, only three of the many available, albeit frequently used measures of well-being, meaning, and posttraumatic growth, were examined. It is possible that other measures show less overlap. Third, psychological well-being, personal meaning, and posttraumatic growth do not cover the full spectrum of positive mental health [16]. To identify the domains of a core outcome set for cancer survivors' positive mental health, future studies should include a broader variety of measurement instruments [36]. Such a core outcome set of positive mental health in cancer survivors can be used routinely to document and compare effects of psychosocial intervention on survivors' positive mental health.

The majority of cancer survivors have no clinical level of distress, but there is a large differentiation in their level of positive mental health [2]. Since a growing number of survivors will live for an increasing number of years [37], it becomes important that high-quality psychosocial interventions are available that stimulate positive mental health and help survivors adjust to the aftermath of cancer. The efficacy of interventions can only be evaluated when their effects can be monitored properly. This study contributes to the understanding of positive mental health in cancer survivors and to develop a core outcome set.

## Conclusion

Psychological well-being and personal meaning overlap to a large extent in cancer survivors, while posttraumatic growth and religiosity can be seen as distinguished constructs. These findings facilitate researchers to select the appropriate PROMs when testing the effect of a psychosocial intervention on positive mental health in cancer survivors.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This article does not contain any studies with animals performed by any of the authors.

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