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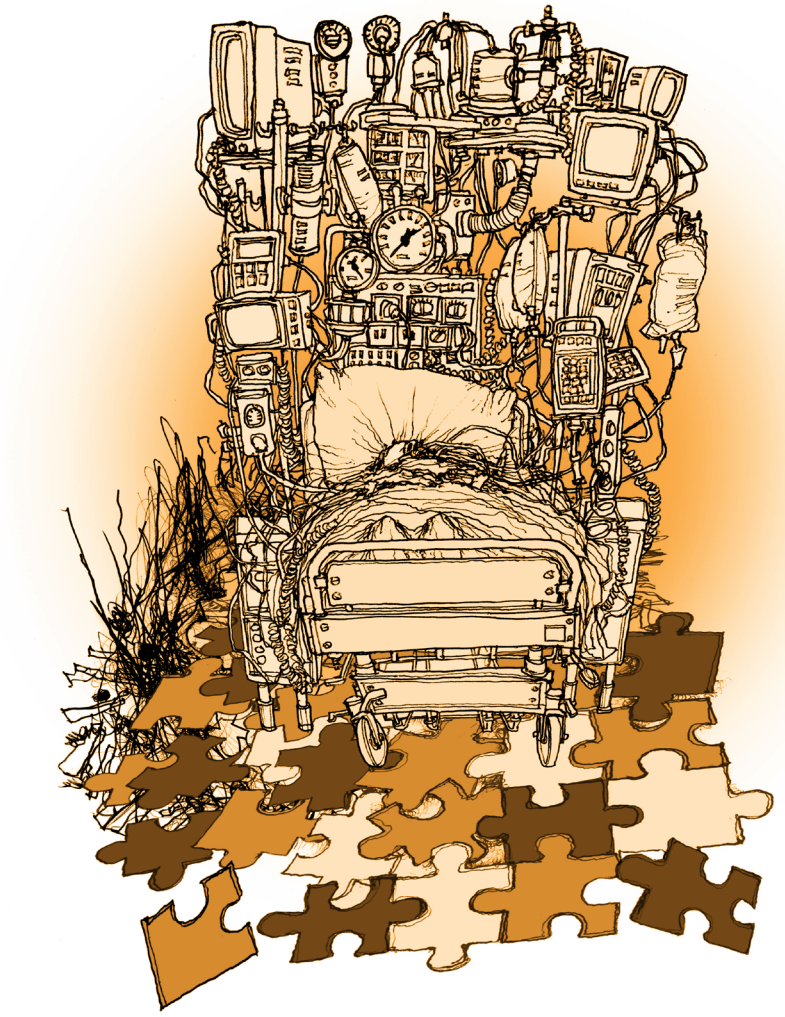
PSYCHOMETRIC PROPERTIES OF THE RE-LIFE QUESTIONNAIRE



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PSYCHOMETRIC PROPERTIES OF THE RE-LIFE QUESTIONNAIRE

This chapter is based on:
Hartog ID*, Oreel TH*, Scherer-Rath M, Netjes JE, Vonk ABA, Lemkes JS, Henriques JPS, Sprangers MAG, Van Laarhoven HWM, and PT Nieuwkerk. ***Experience of contingency and narrative integration after a cardiac intervention: psychometric properties of the Reconstruction of Life Events Questionnaire (RE-LIFE).*** *Submitted*. * = shared first authorship

Contribution of the author of this dissertation:

The author participated in the design, planning and organization of the empirical study and in the data collection and interpretation of the data. In addition, the author wrote the first draft of the article and revised several versions based on feedback of all co-authors.

ABSTRACT

To enable research on the process of integrating an experience evoked by a disruptive life event (an experience of contingency) into one's life story, we developed the Reconstruction of Life Events questionnaire (RE-LIFE). The aim was to test its scale structure, the internal consistency reliability of the multi-item scales, and the convergent validity of the two key scales "experience of contingency" and "narrative integration."

Two-hundred-thirty-seven patients with stable coronary artery disease completed the RE-LIFE six months after a cardiac intervention. Convergent measures assessed quality of life (SF-36), post-traumatic growth (PTGI), personality (HEXACO-SPI) and sociodemographic characteristics.

Principal axis factoring identified seven multi-item scales that were theoretically warranted. The internal consistency reliability was acceptable to excellent for the scales with more than two items. The two key scales yielded significant relationships with quality of life and/or post-traumatic growth in the expected direction. Relationships with personality and sociodemographic characteristics were nonsignificant.

The RE-LIFE is a promising tool that may facilitate research and may support spiritual counselors to help patients integrate experiences of contingency into their life narratives.

INTRODUCTION

Falling seriously ill may confront people with the randomness of life and conflict with their life goals and worldview, evoking existential questions [1]. Combining theories on contingency and narrative identity from religious studies, philosophy and narrative psychology, we developed a theoretical model of the way people may integrate such disruptive life events into their personal life story and how this ultimately affects their quality of life (QoL) [2]. This "narrative meaning making and integration of life events" model revolves around the experience of contingency [3] that disruptive life events can evoke. The term "contingency" refers to the "randomness" of life, meaning that the events that befall us could also have been otherwise [4]. An experience of contingency is defined as a crisis of meaning, resulting from high-impact life events that confront people with this randomness of life [5, 6]. This crisis of meaning pertains to two of the three commonly distinguished dimensions of meaning (coherence, purpose and significance [7]), namely purpose and coherence. Such an experience is caused by a conflict between a disruptive life event and one's ultimate life goals (the "purpose" facet). Such events can initially not be interpreted within the context of one's life narrative and self-understanding (the "coherence" facet) and thus require narrative reinterpretation, a concept resembling narrative meaning making used in health psychology [7, 8]. During this process of reinterpretation or meaning making, the event may be integrated into the life narrative to a greater or lesser extent, and may be given a meaningful place.

Our theoretical model describes this process of narrative meaning making and integration, entailing seven concepts (see Figure 1). As a *life event*, falling ill may conflict with a person's *worldview* and/or *ultimate life goals*: the goals that are of ultimate value for the person, which are anchored in their worldview. This conflict may lead to an *experience of contingency*: a confrontation with the randomness of life that disrupts one's life story, makes one aware of the vulnerability of everything valuable, and evokes existential questions. This experience may start a process of *narrative meaning making* in which the event is reinterpreted within the context of one's own life narrative. This process, in which the life story has to be reconstructed, may result in *narrative integration* of the life event: the extent to which the life event is given a meaningful place in one's life story, without disregarding the contingent nature of the event. This narrative integration is expected to lead to a new perspective on the event and one's life goals, embracement of positive new possibilities, and a changed narrative identity. In terms of meaning in life, it is thought of as restoring one's sense of comprehensibility and of one's life making sense (the "coherence" facet) and one's sense of core goals, aims and direction in life (the "purpose" facet) [7]. Because of the fundamental human need for understanding, coherence and meaning [7, 9], it is hypothesized that experiences of contingency have

a negative, and narrative integration a positive impact on the *QoL* experienced by the person. The theoretical model is depicted in Figure 1 and we refer the reader to Hartog et al. 2020 [2] for a more elaborate description of the model.

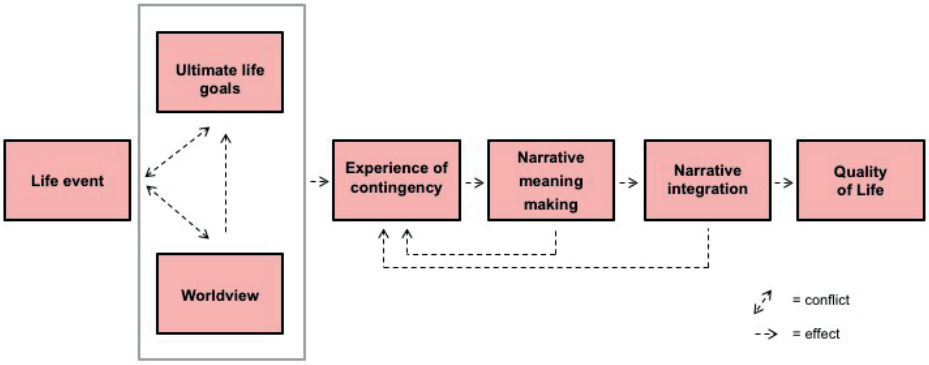

Figure 1. Theoretical model: *Narrative meaning making of life events* [2]

Concepts from religious studies and narrative psychology are increasingly used in interventions aiming to improve patients' QoL through fulfilling existential and spiritual needs. For example, "narrative interventions" aim to support patients in (re)constructing a narrative in which the event of falling ill is included in a meaningful way (See Chapter 5) [10, 11]. However, the effects of the interventions are usually assessed using distal outcome measures such as well-being or health-related QoL (HRQoL), instead of assessing changes in patients' meaning making [10, 12]. We therefore operationalized the concepts of the model "Narrative meaning making and integration of life events" in the Reconstruction of Life Events questionnaire (RE-LIFE). The theoretical background and the development of the concepts and questionnaire have been published before [2]. A previous study confirmed the major hypothesized relationships among the concepts empirically with the aid of mediation analyses [13]. However, the reliability and convergent validity of the scales still need to be investigated.

To test the convergent validity of the RE-LIFE, we examined hypothesized relationships between the key elements, "experience of contingency" and "narrative integration," with other variables. We formulated two main hypotheses. First, in addition to their relationship with overall QoL, we examined their relationship with the more comprehensive construct HRQoL, which pertains to patients' subjective evaluation of the effects of diseases and treatments. We expected people who indicated having "experienced contingency" to have a worse overall QoL and HRQoL than people who did not indicate such an experience. We also expected people who indicated to have achieved "narrative

integration" to experience better overall QoL and HRQoL than patients who had not (yet) succeeded to integrate the event in their life narrative.

Second, the concept of narrative integration is thought to concur with the concept of posttraumatic growth, defined as the experience of positive change resulting from the struggle with highly challenging life crises [14]. It is suggested that posttraumatic growth, like narrative integration, mutually interacts with the development and revisions of a person's life narrative after traumatic life events [14]. Therefore, we expected that patients who experience narrative integration also experience posttraumatic growth.

We further explored whether experience of contingency and narrative integration may be influenced by personal characteristics, such as personality and sociodemographic characteristics. People who score high on *emotionality*, experience more fear, stress and anxiety in response to difficulties in life [15], and may experience more contingency and less narrative integration. Conversely, people who score high on agreeableness are more flexible [16] and more able to adapt, and may therefore experience less contingency and more narrative integration.

As for sociodemographic characteristics, it may be expected that women will reach more narrative integration than men, as women tend to report more benefits after trauma [17]. Whereas the relationship between age and posttraumatic growth has been found to be ambiguous [18], we expected older people to be better able to deal with disruptive life events as a result of experiences with earlier setbacks. Thus, it is expected that older people experience less contingency and more narrative integration than younger people. Lastly, people who consider themselves religious may more frequently relate their actions and life events that befall them to a dimension that transcends our human world than non-religious people [19]. They may have a broader framework of reference that enables them to integrate disruptive life events into their life narrative more easily. Thus, we expect religious people to experience more narrative integration than non-religious people.

In the present study, we administered the RE-LIFE to patients with stable coronary artery disease who had undergone an elective cardiac intervention. We expected the diagnosis of the heart condition, in combination with the cardiac intervention, to be a sufficiently disruptive life event to induce an experience of contingency in many patients. The specific objectives were twofold. First, to identify the underlying scale structure of RE-LIFE items and their corresponding internal reliability consistency. Second, to conduct an initial validation of the RE-LIFE by examining relationships of the key scales experience of

contingency and narrative integration with overall QoL, HRQoL, posttraumatic growth, personality and the background characteristics age, gender, and religion.

METHODS

Patients and study design

The RE-LIFE was tested within the context of the IMPACT study (Oreel et al., 2020), in which patients with stable coronary artery disease (CAD) were recruited at the cardiology departments of the Amsterdam University Medical Centers (Amsterdam UMC): Academic Medical Center (AMC) and VU Medical Center (VUmc) locations. Patients of both centers, including those referred by regional hospitals, were discussed in the multidisciplinary "heart teams." Patients were eligible if they were scheduled for an elective percutaneous coronary intervention (PCI; angioplasty) or elective coronary artery bypass graft (CABG; bypass surgery) at the AMC or VUmc and had at least one confirmed diagnosis of an additional chronic, somatic disease. Criteria for exclusion were insufficient command of the Dutch language and having cognitive impairments due to mental retardation, brain hemorrhage, cerebral infarction or dementia. As the central ethics committee decided that the Medical Research Involving Human Subjects Act did not apply, the study was exempted from further ethical assessment. Written informed consent was obtained from all patients.

Consenting patients completed a set of questionnaires, including those on HRQoL, prior to, and two weeks, three months and six months after their cardiac intervention. At three and six months, the RE-LIFE was included in the questionnaire set. For this study, we used the data collected at six months for theoretical and practical reasons. Theoretically, as narrative meaning making and integration is a process that takes time, we expected the process to be more advanced at six months with more patients reporting narrative integration. Practically, because the convergent measure on post-traumatic growth was only administered at the six-month period. Patients had the choice between completing questionnaires on paper or online.

The RE-LIFE questionnaire

Format of the questionnaire

The RE-LIFE starts with a request to draw a "lifeline," with life events as high and low points. Next, respondents are asked to choose the most unexpected negative life event from their lifeline, and answer a series of questions with this event in mind. These questions pertain to the experience of contingency, narrative meaning making, narrative

integration and impact of the event on ultimate life goals. After this series of questions, the same questions are repeated with respect to the experience of being diagnosed with a heart condition. Patients are then asked about the importance of each ultimate life goal in general, and their worldview. Finally, patients are asked to rate their overall QoL. For this paper, we analyzed only the responses to items about the experience of being diagnosed with a heart condition, the negative life event of our model that all patients shared, enabling cross-respondent comparisons.

Operationalization of the theoretical concepts

Based on theory [3] and the analysis of in-depth interviews with advanced cancer patients [1], we formulated the self-report items. The hypothesized multi-item scale structure of the RE-LIFE is depicted in Figure 2. The Items and response categories of the multi-item scales are provided in Table 2.

The concept *ultimate life goals* was operationalized by 15 life goals that are thought to give ultimate meaning to people's lives. Respondents are asked to rate the extent to which the event either hindered or helped them in pursuing each life goal. These items are not expected to form a scale and items are handled individually, as each life goal can be considered a theme in itself and the impact on every life goal may differ.

For the operationalization of the concept *worldview*, we distinguish three types: *absolute immanence* (relating to the human, intelligible world only), *immanent self-transcendence* (contact with or influence/inspiration from the transcendent) and *absolute transcendence* (everything is determined by a higher power). Each type is operationalized by two items.

The concept *experience of contingency* is operationalized by 5 items about crises of meaning, resulting from high-impact life events that confront people with the randomness of life.

The concept of *narrative meaning making* is subdivided into three separate aspects relevant to people's narrative interpretation of life events: *evaluation* (the attribution of a positive or negative meaning to the life event; 2 items), *agency* (the perceived role of the person as active or passive; 3 items) and *scope* (the scale or span of the meaning the event has for the person: situational, existential or spiritual; 5 items).

The concept of *narrative integration* entails four modes of increasing integration of the event into the life story: *denying* (no acknowledgment of the contingency or the existential meaning of the event), *acknowledging* (the event is interpreted as a disruption of

the life story, evoking existential questions), *accepting* (re-interpretation, active search to integrate the event into the life story) and *receiving* (complete integration of the event into the life story, embracing the positive new possibilities that emerge from the life event). Each mode is operationalized with three items. For purpose of convergent validity, we will only use the last scale, *receiving*, indicating complete integration.

Since the final concept *QoL* is measured by well-validated questionnaires, we chose the item on overall QoL from the EORTC Quality of Life Core Questionnaire (EORTC QLQ-C30) [20]. This item assesses respondents' overall quality of life during the past week. The 7-point response scale was transformed into a 0-100 scale, with higher scores indicating better overall QoL.

Convergent measures for experience of contingency and narrative integration

Health-related quality of life

HRQoL was measured with the 36-Item Short Form Health Survey, version 1 (SF-36v1) [21]. This questionnaire assesses eight health concepts of HRQoL that can be combined into two summary scales: the physical (PCS) and mental component score (MCS). PCS and MCS scores range from 0 to 100, with higher scores indicating better HRQoL.

Posttraumatic Growth

Posttraumatic growth was assessed using the Posttraumatic Growth Index (PTGI), developed to determine how successful individuals are in "reconstructing or strengthening their perceptions of self, others, and the meaning of events" after a traumatic event [17]. The questionnaire comprises 21 items and employs a 6-point Likert scale ranging from 0 ("not") to 5 ("to a very great degree"), reflecting how much positive change was experienced as a result of the respondent's crisis. In our study, the word "crisis" was changed into "your heart condition and/or its treatment." A total PTGI score was calculated, with higher scores indicating more posttraumatic growth [14].

Personality

Two personality dimensions, emotionality and agreeableness, were assessed with the HEXACO Personality Inventory – Dutch, simplified version (HEXACO-SPI) [22]. Both dimensions are assessed with 16 items, scored on a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). Mean scores for both dimensions were calculated, with higher scores indicating more emotionality and more agreeableness, respectively. The HEXACO-SPI was administered three months following the cardiac intervention.

Since personality is a more or less stable characteristic and is not likely to change over a three-month period, including it as a convergent measure is warranted.

Background characteristics

At baseline, patients provided sociodemographic information on gender, age and religion. For religion, the response categories Christian, Muslim, Buddhist, and Jewish were aggregated into the category "religious," whereas the categories atheist and "other" were combined into the category "non-religious."

Statistical analyses

Assumption tests

Scores on all items were checked for floor and ceiling effects (percentage of the lowest and highest possible score, respectively), neutral, and missing responses. We assessed the *underlying scale structure* of the multi-item scales belonging to the concepts worldview, experience of contingency, narrative meaning making and narrative integration separately. In order to test the multicollinearity of the data, the determinant *r* of the correlation matrix was calculated (criterion > 0.00001) [23]. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) was used to test if our sample was large enough for factor analysis (criterion > 0.5) [23]. To test for redundancy between the variables that can be summarized with a limited number of factors, Bartlett's test of sphericity was used (criterion: significance) [23].

Scale structure

To assess the scale structure, first, principal axis factoring (PAF) with oblimin rotation was performed to identify the number of scales for each concept. Kaiser's criterion (eigenvalues ≥ 1), communality of items ≥ 0.20 and the scree plot were used to determine the number of factor solutions. Next, PAF with a fixed number of components, based on the theoretical model and eigenvalues, was performed. Decisions regarding item removal were based on theory and required factor loadings (≥ 0.40 for all items belonging to their own factor, no loading > 0.30 on another factor, and ≥ 0.20 difference with the second highest component loading).

The *internal consistency reliability* of the identified scales (and the convergent measures) was assessed by Cronbach's α and Spearman-Brown coefficients. Cronbach's α estimates of > 0.60 were considered acceptable, given that the RE-LIFE scales have a limited number of items and response options [23]. For the scales consisting of only two items, Spearman Brown is the most appropriate reliability statistic together with

standardized coefficient α [24]. For the convergent scales, internal reliability was assessed using Cronbach's α.

The *convergent validity* of the RE-LIFE was assessed by known-groups comparison. We formed mutually exclusive subgroups of patients who did not report to have experienced contingency (individual mean scores on a 4-point Likert scale from 1 to 2.49) and who did (mean scores 2.50-4); and patients who reported not to have integrated the life event in their life story (receiving scale mean scores on a 5-point Likert scale from 1 to 2.99) and who did (mean score 3-5). Independent t-tests were used to test whether these groups differed on the continuous convergent measures. To examine the magnitude of these differences, effect sizes were calculated using the pooled standard deviations. Following Cohen [25], we interpret effect sizes as small (d = 0.2), medium (d = 0.5), and large (d = 0.8). Chi-square tests were used for testing group differences with respect to categorical convergent measures. We employed a p-value of 0.05. All data were analyzed using "R" Statistical Software, version 3.4.4 [26] (Foundation for Statistical Computing, Vienna, Austria) and SPSS, version 26 (IBM).

RESULTS

Patients

Data collection took place from September 2015 to March 2018. A total of 467 patients were approached for the study, of whom 320 responded (69% response rate). Unfortunately, ethics regulations precluded the investigation for the reasons of non-response. Of the 320 patients who provided demographic information at baseline, 237 (74%) completed the RE-LIFE at the six-month assessment (Table 1). The 83 patients who were lost to follow-up had significantly more often undergone the more invasive bypass surgery (17.7% vs 37.3%; $p < 0.01$). They were not significantly different with respect to age, gender, religion, or number of comorbidities ($p > 0.10$). Of the 237 patients, 169 completed all items of the RE-LIFE, whereas the remaining 68 patients missed one or more items. These latter patients were significantly older (median age 72 versus 67; $p < 0.05$) but were not significantly different with respect to gender, type of cardiac intervention, religion, and number of comorbidities ($p > 0.10$).

Table 1. Sociodemographic and clinical characteristics

	N = 237
Age	
Median (Range)	68 (62-74)
Mean (SD)	67.83 (9.17)
Gender	
Male	172 (72,6%)
Female	65 (27,4%)
Intervention	
Percutaneous coronary intervention	156 (65,8%)
Coronary artery bypass graft	42 (17,7%)
No intervention	39 (16,5%)
Religion	
Non-religious	140 (59,1%)
Religious	97 (40,9%)
Number of comorbidities	
Median (Range)	2 (0-8)
Mean (SD)	2.00 (1.19)

Item characteristics of the RE-LIFE

Floor effects ranged from 0% to 65% and ceiling effects from 0% to 43%. Missing responses ranged from 7% to 12% and neutral responses from 7% to 60%.

Scale construction and internal consistency reliability

For the item scores pertaining to the four concepts, determinant *r* showed no multicollinearity (*Worldview*: 0.049; *Experience of contingency*: 0.014; *Narrative meaning making*: 0.33; *Narrative integration*: 0.049). The KMO measure of sample adequacy indicated that the sample was large enough to conduct factor analyses for each concept (*Worldview*: 0.78; *Experience of contingency*: 0.85; *Narrative meaning making*: 0.67; *Narrative integration*: 0.84). Bartlett's test of sphericity was significant ($p < 0.001$) for all four concepts.

Worldview

PAF indicated two subscales for worldview, instead of the three hypothesized subscales. The first subscale consisted of the items belonging to the first and second hypothesized subscales: absolute transcendence and immanent self-transcendence. Therefore, we named the first identified subscale "transcendence." The scale on "absolute immanence" was confirmed by the data (see Figure 2). The items of these identified subscales explained 50,9% and 8,4% of the variance, respectively (See Table 2).

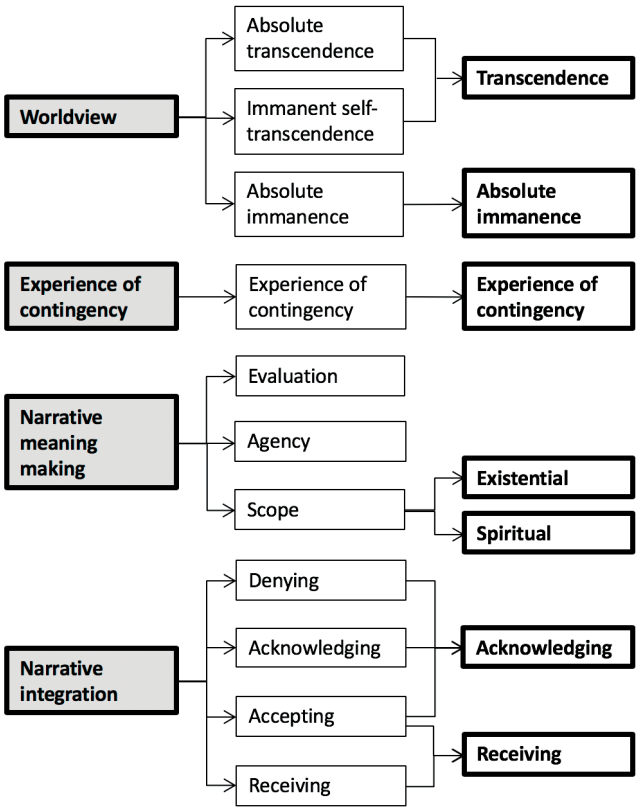

Figure 2. Multi-item scale structure of the RE-LIFE: theoretical concepts (left), hypothesized scales (middle), and identified scales (right).

Experience of contingency

For "experience of contingency," one scale was found, as hypothesized. Its five items accounted for 72% of the explained variance (Table 2).

Narrative meaning making

Five items operationalizing evaluation and agency needed to be removed because they did not meet the criteria as described in Statistical Analyses, or did not comply theoretically with the identified component. For the five remaining items, we identified two subscales, belonging to scope: spiritual and existential (Figure 1). The items of these subscales accounted for 36,1% and 14,7% of the explained variance, respectively (Table 2).

Table 2. Scales, item loadings, Cronbach's α and Spearman-Brown coefficients, commonalities (h^2) and common variances

	Worldview			
Item numbers		**F1**	**F2**	**h^2**
5.1e	What I do in life is ***part of a higher plan*** that I have ***no influence*** over.	0.96	0.16	0.80
5.1c	What I do in life is ***determined by a higher reality***.	0.82	0.01	0.67
5.1a	As a ***free person***, I experience my actions in life as part of ***something that transcends our reality***.	0.71	-0.17	0.66
5.1f	As a ***free person***, I gain ***inspiration/strength*** for the things I do in my life from ***something that transcends our reality***.	0.75	-0.17	0.72
5.1d	What I do in life is ***only determined*** by what exists in ***this world***.	-0.08	0.51	0.30
5.1b	There is ***nothing*** beyond this world that ***influences*** what I do in life.	0.03	0.65	0.40
	Cronbach's α	0.90	0.54	
	Spearman-Brown	0.91	0.54	
	Number of response options	5	5	
	Number of valid cases	213	216	
	F1: Transcendence (% of common variance)	50,9		
	F2: Absolute immanence (% of common variance)		8,4	

	Experience of contingency		
Item numbers		**F1**	**h^2**
3.1c	At the time, getting my heart condition turned my ***world upside down***.	0.93	0.86
3.1b	At the time, getting my heart condition threw me ***off balance***.	0.87	0.76
3.1d	At the time, getting my heart condition made my ***world come crashing down***.	0.89	0.73
3.1e	At the time, getting my heart condition made my ***world come to a standstill***.	0.82	0.66
3.1a	At the time, getting my heart condition came as a ***blow or shock***.	0.73	0.54
	Cronbach's α	0.93	
	Spearman-Brown	0.88	
	Number of response options	4	
	Number of valid cases	220	
	F1: Experience of contingency (% of common variance)	72,0	

	Narrative meaning making			
Item numbers		**F1**	**F2**	**h^2**
3.2i	Looking back, I see that getting the heart condition made me ***feel abandoned***: I missed the presence or support of ***something higher***	0.76	0.41	0.73
3.2j	Looking back, I see ***dealing*** with my heart condition as something ***expected of me by something higher***: a ***calling***	0.72	0.09	0.41

3.2h	Looking back, I see ***dealing*** with my heart condition as ***something I was meant to do in my life***: a ***task or assignment***.	0.66	-0.19	0.48
3.2g	Looking back, I see that getting my heart condition has had ***positive*** consequences for ***my life as a whole***.	-0.51	0.52	0.55
3.2f	Looking back, I see that getting my heart condition has had ***negative*** consequences for ***my life as a whole***. (item is reversely coded)	0.08	0.51	0.26
	Cronbach's α	0.73	0.38	
	Spearman-Brown	0.77	0.38	
	Number of response options	5	5	
	Number of valid cases	224	224	
	F1: Spiritual (% of common variance)	36,1		
	F2: Existential (% of common variance)		14,7	
	Narrative integration			
Item numbers		**F1**	**F2**	**h^2**
3.3b	At the moment, ***I think a lot*** about what my heart condition means for my life. (item is reversely scored)	0.93	-0.42	0.83
3.3c	I find it ***difficult*** to ***come to terms with*** my heart condition. (item is reversely scored)	0.78	-0.11	0.55
3.3a	At the moment, my heart condition makes me ***question*** things about ***my life***.	0.72	0.12	0.61
3.3g	Getting my heart condition currently has a ***great impact*** on my life as a whole.	0.67	0.13	0.46
3.3e	At the moment, I think a lot about the ***cause*** of my heart condition or ***why*** I got it. (item is reversely scored)	0.50	0.31	0.48
3.3d	Meanwhile, I see ***new possibilities*** that have emerged from getting my heart condition.	0.11	0.43	0.24
3.3l	At the moment, I am ***learning*** a lot from getting my heart condition	-0.13	0.84	0.63
3.3j	Getting my heart condition has made me realize what I ***find important*** in life.	0.05	0.58	0.37
	Cronbach's α	0.86	0.64	
	Spearman-Brown	0.82	0.70	
	Number of response options	5	5	
	Number of valid cases	223	224	
	F1: Acknowledging (% of common variance)	40,6		
	F2: Receiving (% of common variance)		11,5	

Responses are scored on a 5-point Likert scale (1 = "strongly disagree", 5 = "strongly agree"), except for the items of "Experience of contingency", which are scored on a 4-point Likert scale (1 = "did not experience", 4 = "experienced very strongly").

Narrative integration

Analyses led to the removal of three items because they did not meet the criteria or did not comply theoretically with the identified components. The analyses of the remaining items indicated two subscales instead of the hypothesized four. The first subscale contained two items pertaining to acknowledging, two items to denying and one item to accepting. These items correspond with the struggle where the life event has not yet been integrated into the life narrative. The items belonging to denying and accepting were reversely scored (see Table 2), their original phrasing pertaining to the meaning of acknowledgement. Therefore, this subscale was named "acknowledging" (Figure 2). The second subscale consisted of two items that belonged to receiving (3.3d and 3.3j), and one item belonging to accepting (3.3l). Because the three items theoretically comply with the meaning of receiving, this subscale was named "receiving." Items of the two subscales explained 40,6% and 11,5% of the variance, respectively (Table 2).

Internal consistency reliability

Internal reliability of most RE-LIFE subscales was acceptable to very high (Cronbach's α ranging between 0.64 and 0.93; Spearman-Brown ranging between 0.70 and 0.91). For two subscales, both consisting of two items, the reliability was insufficient (*Absolute immanence*: Cronbach's α 0.54 and Spearman-Brown 0.54; *Existential meaning*: Cronbach's α 0.38 and Spearman-Brown 0.38). With respect to the convergent scales, internal reliability was good for the personality scales (Cronbach's α 0.70 and 0.78), and excellent for MCS, PCS and PTGI (Cronbach's α 0.90-0.96).

Convergent validity

As expected, patients who indicated to have *experienced contingency* reported significantly lower levels of QoL and MCS than patients who had indicated not to have experienced contingency. The differences for PCS and PTGI were in the expected direction, but only reached marginal levels of statistical significance. Effect sizes were of a small magnitude and ranged from 0.26 to 0.40. Personality and sociodemographic characteristics were not significantly different between the two groups (Table 3).

According to expectation, patients who *received* contingency as an indication of narrative integration, reported higher PTGI scores (large effect size of 0.85). The differences for QOL and PCS were in the expected direction but did not reach statistical significance. Effect sizes were 0.26 and 0.25. The MCS scores, personality, and sociodemographic characteristics were not significantly different between the groups (Table 3).

Table 3. Group differences (t-test or Chi square) based on experience of contingency and narrative integration (receiving scale)

Convergent Variables	**Experience of Contingency**				**Narrative integration: Receiving**			
Quality of life	No	Yes	t	Cohen's d	No	Yes	t	Cohen's d
QoL	N = 94 M = 94.68 SD = 18.97	N = 117 M = 88.18 SD = 20.88	2.37 p<0.05	0.33	N = 131 M = 89.44 SD = 21.70	N = 83 M = 94.58 SD = 17.29	-1.82 p=0.07	0.26
MCS	N = 93 M = 54.21 SD = 8.69	N = 107 M = 49.99 SD = 12.30	2.73 p<0.05	0.40	N = 127 M = 51.85 SD = 11.33	N = 76 M = 52.00 SD = 10.55	-0.92 p=0.93	0.01
PCS	N = 93 M = 41.99 SD = 8.84	N = 107 M = 39.68 SD = 9.27	1.80 p=0.07	0.26	N = 127 M = 40.03 SD = 9.63	N = 76 M = 42.24 SD = 7.89	-1.69 p=0.09	0.25
Post-traumatic growth								
PTGI	N = 95 M = 29.46 SD = 17.31	N = 107 M = 24.30 SD = 19.15	-1.88 p=0.06	0.27	N = 126 M = 16.25 SD = 14.55	N = 80 M = 31.11 SD = 20.09	-5.73 p<0.00	0.85
Personality								
Emotionality	N = 89 M = 3.03 SD = 0.49	N = 110 M = 3.12 SD = 0.48	-1.28 p=0.20	0.19	N = 124 M = 3.04 SD = 3.14	N = 76 M = 3.14 Ad = 0.48	-1.40 p=0.10	0.04
Agreeableness	N = 89 M = 2.80 SD = 0.39	N = 110 M = 2.82 SD = 0.36	-0.51 p=0.61	0.05	N = 124 M = 2.78 SD = 0.36	N = 76 M = 2.87 SD = 0.39	-1.65 p= 0.10	0.24
Sociodemographic characteristics								
Age	N = 100 M = 68.16 SD = 0.05	N = 121 M = 68.33 SD = 8.02	-0.15 p=0.88	0.03	N = 139 M = 67.83 Sd = 8.58	N = 85 M = 68.86 SD = 8.47	-0.88 p=0.38	0.12
Gender								
Male	N = 73 (45,3%)	N = 88 (54,7%)	Chi-Square 0.002 (df = 1) p=0.96		N = 61 (37,9%)	N = 100 (62,1%)	Chi-Square 0.22 (df = 1) p=0.64	
Female	N = 27 (45%)	N = 33 (55%)			N = 26 (41,3%)	N = 37) (58,7%)		
Religion								
Non-religious	N = 59 (46,8%)	N = 67 (53,2%)	Chi-Square 0.40 (df = 1) p=0.53		N = 49 (38,3%)	N = 79 (61,7%)	Chi-Square 0.01 (df = 1) p=0.92	
Religious	N = 40 (42,6%)	N = 54 (57,4%)			N = 37 (38,9%)	N = 58 (61,1%)		

QoL is overall quality of life (EORTC QLQ-C30); MCS is mental component score (SF-36); PCS is physical component score (SF-36), PTGI is posttraumatic growth index (Tedeschi & Calhoun, 1996), Personality (HEXACO-SPI).

DISCUSSION

The major hypothesized theoretical concepts of the RE-LIFE were confirmed in this study. Scales were identified that operationalized "worldview," "experience of contingency," "narrative meaning making," and "narrative integration." The hypothesized scale "experience of contingency" was confirmed in its entirety as was the subscale "absolute immanence," belonging to "worldview." For the other hypothesized subscales, items needed to be removed or combined with other items to form new subscales, including "transcendence" as component of "worldview," "acknowledging," indicative of an early phase in narrative integration, and "receiving," indicative of complete narrative integration. Removal of items resulted in the deletion of two hypothesized scales, "evaluation" and "agency," belonging to "narrative meaning making." Finally, one scale had to be split into two, "existential scope" and "spiritual scope," belonging to "narrative meaning making." The resulting scales were all theoretically warranted. The scales were also psychometrically sound with acceptable to excellent internal consistency reliability, with the exception of the scales consisting of two items ("absolute immanence" and "existential meaning"). These two subscales were not deleted, as their items provide additional insights.

The convergent validity results confirmed the main hypothesis that patients experiencing contingency have worse overall and mental QoL than those who do not experience contingency. Moreover, the score patterns of overall and physical QoL, when not statistically significant, were in the expected direction. These effect sizes were all of a small magnitude. The expected relationships with personality and sociodemographic characteristics were not found. In an earlier mediation analysis, focusing on the internal relationships of the components of the theoretical model, in the same patient group three months following the cardiac intervention, we found that experience of contingency was also indirectly related with lower levels of QoL (see Chapter 4) [13]. Three months later, the relationship still holds. The results also confirmed that patients who succeeded to integrate the contingent life event in their life story experience more posttraumatic growth than those who are still struggling. This effect was particularly pronounced, given its large magnitude.

Although the concepts of narrative integration and posttraumatic growth are clearly related, we consider the concept of narrative integration a valuable addition. While the items of the PTGI are mainly tapping into behavior resulting from positive change, the acknowledging and receiving scales focus on the interpretation process and the new insights and attitudes resulting from the narrative integration. In addition, the combination of the receiving scale with the acknowledging scale provides information about the

process, which is particularly insightful when respondents indicate narrative integration to be absent or incomplete.

The question arises why we did not find relationships with personality, despite the use of a validated personality questionnaire. In hindsight, the dimensions emotionality and agreeableness may have been too distal with respect to their relationship with the experience of contingency and narrative integration. For example, agreeableness was selected for its relationship with adaptive behavior, enabling integration. Moreover, the personality questionnaire was administered three months before the administration of the RE-LIFE. Whereas inclusion of the personality data in this study was warranted given the stable nature of personality, we cannot exclude the possibility that the time lag may have added error variance. Finally, the relationships with personality may not exist in this particular homogenous sample of primarily older men.

The nonsignificant relationships with sociodemographic characteristics also merit attention. Whereas previous results were mixed [18], our homogenous sample with its restricted variance in gender and age may have precluded finding significant results if they would exist. However, the distribution of religious versus non-religious patients was about equal and could therefore not explain the nonsignificant results. Since traditional beliefs have become less dominant [27], the distinction between established versus non-established religions per se may have become less meaningful. We cannot exclude the possibility that respondents who endorsed the non-religious or other category may have adopted a non-traditional religious or spiritual belief relevant for integration.

Limitations and strengths

A number of limitations merit attention. First, the typical cardiac patient sample with predominantly older men, limits the generalizability of the study results. The non-respondent analyses indicated a selective attrition with respect to the more invasive cardiac intervention and older patients missing more items, implying a further restriction of the sample to the more fit respondents. Moreover, having undergone a cardiac intervention may not have been a major, disruptive life event for each patient. The timing of the respondents' diagnosis may have varied, whereas the timing of the cardiac intervention was similar for patients.

Second, the RE-LIFE as administered in the current study, is lengthy, and took most respondents between twenty and sixty minutes to complete because we asked patients to complete most of the items twice, i.e., for two life events. We recommend to focus RE-LIFE on only one negative life event (e.g., self-identified event or a medical condi-

tion). Since the resulting RE-LIFE is shorter than the version we had administered, future completion time is expected to be diminished by approximately a half.

Third, by dichotomizing the patient group in those who do or do not experience contingency and have or did not have integrated the life event, we may have lost information in comparison to keeping these variables continuous. Moreover, we kept all respondents in the analyses whereas one may expect to find only substantial differences between patients scoring high or low on these variables. However, our analyses enabled the investigation of all convergent variables in the same way. Finally, our analyses can be criticized for its multiple comparisons in relation to the sample size. However, we formulated specific hypotheses and calculated effect sizes as an indication of the clinical meaningfulness of the findings.

The study also has a number of strengths. Eligible patients were carefully recruited and had medically confirmed diagnoses and comorbidities. All patients had undergone a cardiac intervention that was expected to induce an experience of contingency in most. The longitudinal study design, from baseline to six months, allowed patients time to engage in a process of meaning making and narrative integration. Finally, we used standard and well validated convergent measures.

Future applications

To the best of our knowledge, this is the first time that an attempt has been made to operationalize the process of narrative meaning making with theoretical concepts from religious studies – experience of contingency and narrative integration – into a quantitative questionnaire. The items were not only based on theory [3] but were also informed by in-depth interviews with cancer patients [1]. These and former results [13] suggest that the RE-LIFE is a promising instrument, warranting further refinement and validation. We envision three types of applications.

First and foremost, the RE-LIFE is useful in theoretical research. The questionnaire is semantically related to existential philosophy and psychology and can provide insight into the pragmatic-phenomenological process [28] of the experience of contingency and narrative integration. For example, why do some people reject the changed life circumstances whereas others accept them as inevitable? Why do some people approach the crisis whereas others do anything to avoid it? Why do some people keep trying to achieve unattainable goals whereas others find new ways to make their lives meaningful? Why do some people have no need to find new meaning whereas for others finding new meaning is the *conditio sine qua non* for being able to move further with their life? The RE-LIFE enables the investigation of such questions by focusing on the interpreta-

tion process invoked by the confrontation with an existential, disruptive life event, such as a life-threatening disease.

Second, in its final form, the RE-LIFE is intended for use in studies assessing the impact of spiritual interventions aiming to improve respondents' QoL through fulfilling existential and spiritual needs. Third, the RE-LIFE can also be used in clinical practice. For example, it could be administered after falling ill or other disruptive life events as a tool to support the communication between a spiritual counselor and the respondent. Based on the responses to the RE-LIFE, the spiritual counselor may further explore the interpretation process and subsequently help respondents to find meaning and to integrate the disruptive life event into their life narratives. When administered at subsequent times, the process of meaning making and narrative integration can be monitored and support be provided as needed. To exemplify, we are currently conducting a study among advanced cancer patients whom we offer different forms of art to empower them to create their own, new narratives of life. The RE-LIFE is used over time, first to help patients to articulate their current story and then to help them to revise their life story accommodating the contingent life events. It is our hope that the RE-LIFE will provide useful information in such future studies.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author's contributions

MS, HvL, PN, MS-R and JH are responsible for the conception of the study. JN, IH, MS, PN and HvL designed the study. IH and JN planned and organized the study and collected the data, supported by AV and JL. MS and PN supervised the data acquisition. TO and MS-R analyzed the data. IH, MS-R and HvL interpreted the data. IH wrote the first draft of

the article. PN and MS revised several versions of the article. All authors commented on the semi-final version of the article. All authors read and approved the final manuscript. IH is the corresponding author.

Ethics approval and consent to participate

As the central ethics committee (Medisch Ethische Toetsings Commissie AMC) decided that the Medical Research Involving Human Subjects Act did not apply, the study was exempted from further ethical assessment. Written informed consent was obtained from all patients.

Competing interests

The authors declare that they have no competing interest.

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