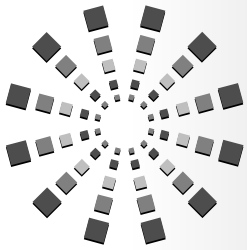

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Time Perception of Cancer Patients Without Evidence of Disease and Advanced Cancer Patients in a Palliative, End-of-Life-Care Setting

KEY WORDS
Curative care
Depression
End-of-life care
Hopelessness
Palliative care
Quality of life
Time perception

Background: Time perception may be an important factor influencing distress of cancer patients. However, no comparative studies have been performed for cancer patients without evidence of disease and advanced cancer patients in the palliative, end-of-life-care setting. **Objective:** The objectives of the study were to assess time perception in disease-free and advanced cancer patients and examine the relation of time perception with patients' distress. **Methods:** A descriptive research design was used. Ninety-six disease-free and 63 advanced cancer patients filled out Cottle's Circle Test to assess time coherence and time dominance, Cottle's Line Test to assess temporal extension and Bayes' question on speed of time, the European Organisation for Research-and-Treatment of Cancer QOL–Questionnaire version 2.0, Beck's Depression Inventory for primary care, and Beck's Hopelessness-Scale. **Results:** In patients without evidence of disease, future dominance was most often observed, whereas in advanced cancer patients, the present was the dominant time segment. In both groups, a focus on the past was associated with distress. In contrast with patients without evidence of disease, advanced cancer patients perceived time as moving slowly, and this was correlated with distress. **Conclusions:** The time perception of cancer patients without evidence of disease and advanced cancer patients is significantly different and is

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related to distress. **Implications for Practice:** The observed relation between a focus on the past and distress gives room for interventions of nurses and other healthcare professionals. Specific attention is needed for differences between cancer patients without evidence of disease and advanced cancer patients.

What, then, is time?
If no one asks me, I know;
If I want to explain it to someone who asks me,
I do not know.
St Augustine's Confessions,[1] Book 11, Chapter 14

The paradox of time is that, although it hardly needs any discussion that time is an essential aspect of human life, time cannot be grasped. It cannot be seen, felt, heard, tasted, or smelled, and even when we think about time, it seems to escape our understanding. As St Augustine ponders in the 11th book of his *Confessions*: "Now, what about those two times, past and future, in what sense do they have real being, if the past no longer exists and the future does not exist yet? As for present time, if that were always present and never slipped away into the past, it would not be time at all; it would be eternity. If, therefore, the present's only claim to be called 'time' is that it is slipping away into the past, how can we assert that this thing is, when its only title to being is that it will soon cease to be? In other words, we cannot really say that time exists, except because it tends to nonbeing."[2]

Nevertheless, in our Western culture, time is often viewed as a measurable, external process that regulates our lives by ticking away the seconds, minutes, and hours.[3] It is the measure by which we know when to get to work, when to meet deadlines, when to eat, when to sleep, when to celebrate holidays. From this perspective, time can be measured with a stop watch; it is clock time. Time is that what we have to keep up with. However, time is also experienced as a more personal, internal process. This so-called embodied time does not necessarily keep up with clock time.[4,5] One hour may fly away when we are caught up in something, whereas that same hour may seem to last forever when we are waiting. Embodied time implies that time is subjective and that the perspective of time may change according to the situation one experiences. In the words of the American philosopher and psychologist, William James: "The knowledge of some other part of the stream, past or future, near or remote, is always mixed in with our knowledge of the present thing."[6] As St Augustine already formulated: "It is inaccurate to say, 'There are 3 tenses, or times: past, present, and future,' although it might properly be said, 'There are 3 tenses or times: the present of past things, the present of present things, and the present of future things.'"[7]

One of the situations that may fundamentally alter one's time perception is the diagnosis of cancer. Although advances in treatment options have improved cancer outcome, still about half of the cancer patients cannot be cured, and many of the patients that can be cured have to deal with the long-term adverse effects of cancer treatment.[8] Moreover, even in early stages, it can never be guaranteed that one is cured. It is well known that the diagnosis of cancer is accompanied with distress in all stages.[9] Also, previous studies have described aspects of an altered time perception in cancer patients and their primary caregivers.[4,10–15] However, comparative studies between disease-free cancer patients and advanced cancer patients with respect to their time perception are lacking, nor are data available on how time perception in these patient groups is related to distress. Therefore, in this study, we will compare time perception of cancer patients without evidence of disease and advanced cancer patients in a palliative, end-of-life-care setting and examine the relation of time perception with patients' distress.

■ Time Perception

In this study, we will use the concept of time as embodied time and refer to time perception as an orientation of the individual on the past, present, and future, in view of a continuously changing present.[16] We will distinguish 4 aspects of time perception: time coherence, time dominance, temporal extension, and speed.

Time coherence refers to the degree in which events in the past, present, and future are experienced as a continuous whole. Time dominance refers to the prevailing orientation in one's time perception. One can be predominantly focused on the present (present dominance) or on the past or future (past dominance or future dominance). Temporal extension describes the relative length of the past, present, and future compared with one's lifetime. Although time dominance is closely related to temporal extension, it is conceptually distinct, as in temporal extension a linear conception of time is assumed, which is not necessarily the case for time dominance. In a previous study among terminally ill cancer patients, a shorter future temporal perspective was reported compared with a healthy control group.[11] In contrast, for cancer survivors, a new orientation on the future may emerge when patients remain disease-free.[12]

The speed of time refers to the experience that time may have passed away faster or slower than the actual (clock) time that has passed away.[6] When time is perceived as moving quickly (high speed), one has the idea that less time has passed than is actually indicated by the clock; time seems to run away. In contrast, when time is perceived as moving slowly, one has the experience that more time has elapsed than is the case according to clock time; time seems to drag. In previous studies of terminally ill patients, no differences were observed in the speed of time passage compared with healthy subjects.[10,11] However, no comparative studies have been performed with cancer survivors.

Time Perception and Distress

Previous studies on time perception and distress have primarily focused on speed of time. From everyday experience, it is well known that time may move fast when one feels well ("time flies when having fun"), whereas time is "hanging heavy" when one is not. Bayes et al[17,18] studied this phenomenon in 371 terminally ill patients (314 oncological and 57 AIDS patients) by asking "How long did yesterday (or this morning, afternoon, evening, night) seem to you?" Answers could be "long" or "very long" and "short" of "very short." Patients were also asked to rate their condition as "very bad," "passable bad," "good," or "very good." A good correlation between speed of time and perceived condition was observed: when the day was perceived as long or very long (ie, low speed), the condition was perceived as bad or very bad, whereas a high speed was reported when one's self-reported condition was rated good or very good.

The relation between speed of time and distress may be understood from a cognitive information processing point of view. Processing of information from the environment is achieved by "taking up" information and "storage" of the information. A given period is perceived as extended or lengthened if the number of events that need to be taken up is increased and stored in a disorganized fashion.[19,20] Conversely, a given time interval is perceived as reduced when the number of events is decreased, or when the person is better able to organize, chunk, or code the information. When regarding perceived distress as a stimulus that needs to be processed, it may be hypothesized that with distress, time intervals are perceived as lengthened (ie, speed of time seems to slow down) compared with a situation without distress. This hypothesis was confirmed in a study of 70 cancer and 17 noncancer patients with pain. Greater pain intensity was associated with an overestimation of given time intervals, and the majority of pain patients reported a perceived slowing down of time while in pain.[21]

Research Questions

In the present explorative study, the following 3 questions are addressed:

1. Does time perception differ between disease-free cancer patients compared with advanced cancer patients in the palliative, end-of-life-care setting?
2. What is the relation between time perception and distress in disease-free cancer patients and advanced cancer patients in the palliative, end-of-life-care setting?
3. Do relations between time perception and distress differ between disease-free cancer patients without evidence of disease compared with advanced cancer patients in the palliative, end-of-life-care setting?

Methods

This study used a descriptive research design. The study was part of a larger research project on quality of life (QOL) in curatively treated and palliative cancer patients no longer receiving anticancer treatment. Previously, we have reported the use of coping strategies in this patient population and the relation of these coping strategies with QOL, depression, and hopelessness.[22] The study was approved by the institutional medical ethical board of our institute, and all participating patients gave written informed consent. The inclusion criteria for disease-free cancer patients were as follows: patients with a history of treatment for a solid tumor, end of treatment less than 1 year ago, no signs of acute treatment toxicities, and no evidence of disease. Patients who were on adjuvant hormonal therapy could also be included in this group. The inclusion criteria for the advanced cancer patients in the palliative, end-of-life-care setting were as follows: patients with advanced solid tumors, not receiving antitumor therapies, and recovered from acute treatment toxicities at the moment of inclusion. Exclusion criteria for both groups were as follows: inability to read Dutch or extreme morbidity precluding filling out a questionnaire.

As described previously, a questionnaire was sent to 236 eligible patients, 123 disease-free and 113 advanced cancer patients.[22] Twenty-three patients without evidence of disease and 40 advanced cancer patients did not return the questionnaire. In both groups, the most important reason (50% in the no evidence of disease group, 39% in the advanced cancer group) for not participating was not specified; 11 patients in the advanced cancer group (9%) deteriorated or died before they could return the questionnaire. Four curatively treated patients and 10 palliative patients did not complete any of the time scales and were excluded from the analysis. Thus, data of 96 disease-free patients and 63 palliative patients were available for analysis. Participants and nonparticipants did not significantly differ by age or sex.

Measurement Instruments

Basic sociodemographic data including age, marital status, and educational level were collected from all participants in a self-administered questionnaire.

To measure the 4 aspects of time perception, several measurement instruments were used. First, to measure time coherence and time dominance, Cottle's[23] Circle Test was used for which content validity has been shown previously.[16,23] Patients were asked to think of the past, present, and future as being in the shape of circles and draw these circles in the way they best represented the relationship of past, present, and future. Then they were asked to label each circle to show which one indicated the past, which one the present, and which one the future. Time coherence was scored as "temporal discretion" when the circles were totally unrelated, "temporal continuity" when the circles touched each other or partially overlapped, and "temporal integration" when the circles fully overlapped (Figure 1) From these circles also, time dominance was determined. Past dominance was scored if the circle indicating the past was largest, present dominance if the circle indicating the present was largest, and future dominance if the circle indicating the future was largest. Time dominance was scored as "other" if there was no "dominant" circle, for example, if all

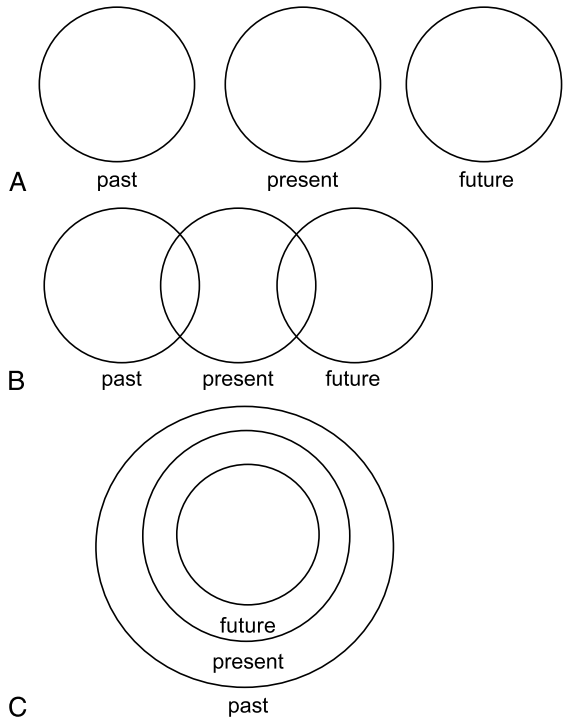

Figure 1 ■ Time coherence as determined from the Circle Test. A) temporal discreteness, B) temporal continuity, C) temporal integration.

3 circles were drawn equally large. Temporal extension was measured by an adapted version of Cottle's[23] Line Test. We asked patients to indicate the extension of their own past, present, and future on a given line (Figure 2). Relative lengths of past, present, and future were measured by taking the length of the line representing past, present, or future and dividing it by the length of the whole life line. Finally, speed of time was measured by asking patients how long the past week had seemed to them.[17,18] Answer categories were "very long," "long," "normal," "short," "very short."

We operationalized distress as QOL, depression, and hopelessness.[24] The following measurement instruments were included in the questionnaire, as described previously.[22] In brief, Global QOL was measured with the Satisfaction With Life scale[25] and health-related QOL with the European Organisation for Research and Treatment of Cancer QOL Questionnaire version 2.0 (EORTC QLQ-C30v2).[26] For the Satisfaction With Life, a sum score was constructed: 5 to 9 indicating extremely dissatisfied, 10 to 14 dissatisfied, 15 to 19 slightly below average, 20 to 24 average, 25 to 29 high satisfaction, and 30 to 35 very high satisfaction. The EORTC QLQ-C30v2 contains 1 scale to measure general health status. Furthermore, it distinguishes between functional scales, such as physical functioning and role functioning, and symptom scales, such as fatigue, pain, and appetite loss. The scores on the functional scales and the global health status of the EORTC QLQ-C30v2 ranged from 0, very bad, to 100, excellent, whereas the symptom scales ranged from 0, not at all, to 100, very much (cf reference value manual for the EORTC QLQ-C30v2 at http://www.eortc.be/home/qol).

Depression was measured by Beck's Depression Inventory for Primary Care.[27] The Beck's Depression Inventory for Primary Care contains 7 items, scored on a 0- to 3-point scale. A sum score of 4 or greater indicates a clinically relevant depression. Hopelessness was measured with Beck's Hopelessness Scale.[28] Beck's Hopelessness Scale contains 20 items with a 2-point scale (I agree, I don't agree). For the 20 items, a sum score is constructed: 0 indicating no hopelessness and 20 indicating maximum hopelessness. Based on the sum scores, patients can be classified into 4 groups: no hopelessness (0–3), mild (4–8), moderate (9–14), and severe (15–20).[29]

Statistical Analysis

To answer the first research question—"Does time perception differ between disease-free cancer patients compared with advanced cancer patients in the palliative, end-of-life-care setting?"—we first identified relevant sociodemographic variables for time perception by looking at associations between measures of time perception and patient characteristics using χ^2 or t tests where appropriate. The sociodemographic characteristics age, living with a partner, education, and employment were all identified as relevant sociodemographic variables. Then, differences in means between the curative and palliative groups were assessed using analysis of covariance with the relevant sociodemographic variables as covariates.

To answer the second research question—"What is the relation between time perception and distress in disease-free cancer patients and advanced cancer patients in the palliative, end-of-life-care setting?"—we performed correlation and regression analyses. Associations between time perception, QOL, depression, and hopelessness were analyzed by partial correlation analysis including the sociodemographic characteristics age, sex, living with a partner, education, and employment. Significant associations with a partial correlation coefficient .30 or greater were taken up in a stepwise regression model, including the sociodemographic factors as independent variables and measures of QOL, depression, and hopelessness as dependent variables. In stepwise regression in SPSS, each variable is entered in sequence and its value assessed. If adding the variable contributes to the model, then it is retained, but all other variables in the model are then retested to see if they are still contributing to the success of the model. If they no longer contribute significantly, they are removed. This method ensures we will end up with the simplest equation with the best predictive power.

To answer the third research question—"Do relations between time perception and distress differ between disease-free

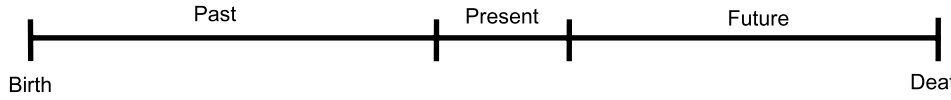

Figure 2 ■ Time extension. Patients were instructed to draw the duration of their past, present and future on a line in which "birth" and "death" were already given at the far ends of the line.

cancer patients without evidence of disease compared with advanced cancer patients in the palliative, end-of-life-care setting?''—we assessed whether a significant partial correlation coefficient identified in one patient group was significantly different from the partial correlation coefficient in the other patient group using Fisher r-to-Z formula.[30]

All statistical analyses were performed with SPSS (version 16.0.1; SPSS Inc, Chicago, Illinois). Statistical inferences were based on 2-sided tests, with $P < .05$ considered to be statistically significant. In the partial correlation analyses, a more stringent significance level of $P < .01$ was used to partly correct for multiple testing.

■ Results

Participants

The sample consisted of 159 patients, 74 males and 85 females. The mean age was 57 (SD, 13) years. Baseline characteristics of the sample designated by disease-free or advanced cancer setting are presented in Table 1.

Research Question 1: Does Time Perception Differ Between Disease-Free Cancer Patients Compared With Advanced Cancer Patients in the Palliative, End-of-Life-Care Setting?

We first identified relevant sociodemographic variables for time perception by looking at associations between measures of time perception and patient characteristics. The sociodemographic characteristics age, living with a partner, education, and employment were all significantly associated with 1 or more of the measures of time perception (Table 2). Then, between-group differences (disease-free versus advanced) were assessed using analysis of covariance with the relevant sociodemographic variables as covariates.

No differences were noted between cancer patients without evidence of disease and advanced cancer patients with respect to time coherence. In both groups, more than 60% adhered to a discrete vision on past, present, and future, whereas a minority (≤5%) adhered to an integrated vision. The remainder favored a perspective of continuity. However, in patients with advanced cancer, significantly more present dominance was noted compared with patients without evidence of disease. In contrast, future dominance was significantly more observed in patients without evidence of disease ($P < .05$). These results for time dominance reflected the data obtained for temporal extension: the observed relative length of the presence compared with the life line as a whole was 26.2% for patients without evidence of disease versus 35.2% for advanced cancer patients ($P < .01$), and the relative length of the future was 34.9% for patients without evidence of disease versus 22.0% for advanced cancer patients ($P < .001$). Speed of time was experienced significantly different between the advanced cancer patients and patients without evidence of disease: for patients without evidence of disease, their past week seemed significantly shorter than for patients with advanced cancer ($P < .001$).

Table 1 • Population Characteristics

	Curative (n = 96), n (%)	Palliative (n = 63), n (%)	Total (n = 159), n (%)
Male	43 (45)	31 (49)	74 (47)
Female	53 (55)	32 (51)	85 (53)
Age, y			
Mean	53	62	57
SD	13	10	13
Relationship			
Living with a partner	80 (85)	42 (68)	122 (78)
Living alone	14 (15)	20 (32)	34 (22)
Education			
Primary	20 (21)	12 (19)	32 (20)
Secondary	50 (53)	38 (62)	88 (56)
Tertiary	25 (26)	12 (19)	37 (24)
Employment			
Paid job	40 (42)	18 (29)	58 (37)
No paid job	55 (58)	45 (71)	100 (63)
Tumor type			
Breast	34 (35)	9 (14)	43 (27)
Prostate	16 (17)	2 (3)	18 (11)
Testis	13 (14)	0 (0)	13 (8)
Lung	9 (9)	9 (14)	18 (11)
Colon/rectum	4 (4)	13 (21)	17 (11)
Melanoma	6 (6)	5 (8)	11 (7)
Other (15 different cancer types)	14 (15)	25 (40)	39 (25)

Where appropriate, frequencies are presented with valid percentages in brackets.

Research Question 2: What Is The Relation Between Time Perception and Distress in Disease-Free Cancer Patients and Advanced Cancer Patients in the Palliative, End-of-Life-Care Setting?

Tables 3 and 4 show the results of the partial correlation and regression analyses of measures of time perception and measures of QOL, depression, and hopelessness for both cancer patients without evidence of disease and advanced cancer patients.

Of measures of time perception, speed of time was most frequently associated with measures of distress, that is, with global health status, social functioning, emotional functioning, constipation, and depression. These associations were

Table 2 • Patient Characteristics by Level of Agreement With Time Perspective

Time Category	Patient Group	Score	Age (SD, n)	Male Sex (%, n)	Living With a Partner (%, n)	Education Less Than Vocational Training (%, n)	Employed (%, n)
Time coherence: discrete	Curative	Yes	54.1 (14.0, 55)	28 (50.9, 55)	46 (85.2, 54)	22 (40.0, 55)	21 (38.9, 54)
		No	49.7 (13.4, 25)	10 (40.0, 25)	19 (79.2, 24)	5 (20.8, 24)	13 (52.0, 25)
	Palliative	Yes	63.0 (8.7, 35)	16 (45.7, 35)	27[a] (79.4, 34)	21[a] (60.0, 35)	10 (28.6, 35)
		No	60.7 (12.1, 20)	10 (50.0, 20)	10 (50.0, 20)	5 (26.3, 19)	8 (40.0, 20)
Time coherence: continuity	Curative	Yes	49.1 (13.4, 21)	8 (38.1, 21)	15 (75.0, 20)	3[a] (14.3, 21)	12 (57.1, 21)
		No	54.0 (14.0, 59)	30 (50.8, 59)	50 (86.2, 58)	24[b] (41.4, 58)	22 (37.9, 58)
	Palliative	Yes	60.5 (12.5, 18)	9 (50.0, 18)	10 (55.6, 18)	3 (17.6, 17)	7 (38.9, 18)
		No	63.0 (8.6, 37)	17 (45.9, 37)	27 (75.0, 36)	23 (62.2, 37)	11 (29.7, 37)
Time coherence: integration	Curative	Yes	52.5 (15.3, 4)	2 (50.0, 4)	4 (100.0, 4)	2 (66.7, 3)	1 (25.0, 4)
		No	52.7 (14.0, 74)	36 (47.4, 76)	61 (82.4, 74)	25 (32.9, 76)	33 (44.0, 75)
	Palliative	Yes	62.5 (10.6, 2)	1 (50.0, 2)	0[a] (0.0, 2)	2 (100.0, 2)	1 (50.0, 2)
		No	62.1 (10.1, 53)	25 (47.2, 53)	37 (71.2, 52)	24 (46.2, 52)	17 (32.1, 53)
Past dominance	Curative	Yes	54.8 (12.7, 28)	13 (46.4, 28)	24 (85.7, 28)	10 (35.7, 28)	12 (44.4, 27)
		No	51.4 (15.0, 48)	24 (50.0, 48)	37 (80.4, 48)	15 (31.7, 47)	18 (37.5, 48)
	Palliative	Yes	62.7 (10.9, 27)	12 (44.4, 27)	16 (61,5, 26)	14 (51.9, 27)	10 (37.0, 27)
		No	61,5 (9.2, 25)	13 (52.0, 25)	18 (72.0, 25)	10 (41.7, 24)	8 (32.0, 25)
Present dominance	Curative	Yes	50.0 (13.9, 15)	8 (53.3, 15)	13 (86.7, 15)	2 (13.3, 15)	7 (47.7, 15)
		No	53.3 (14.3, 61)	29 (47.5, 61)	48 (81.4, 59)	23 (38.3, 60)	23 (38.3, 60)
	Palliative	Yes	59.4 (8.7, 17)	8 (47.1, 17)	13 (76.5, 17)	5 (29.4, 17)	5 (29.4, 17)
		No	63.5 (10.5, 35)	17 (48.6, 35)	21 (61.8, 34)	19 (55.9, 34)	13 (37.1, 35)
Future dominance	Curative	Yes	49.9 (17.3, 22)	12 (54.5, 22)	15 (75.0, 20)	9 (42.9, 21)	6 (27.3, 22)
		No	53.8 (12.8, 54)	25 (46.3, 54)	46 (85.2, 54)	16 (29.6, 54)	24 (45.3, 53)
	Palliative	Yes	65.3 (7.3, 4)	3 (75.0, 4)	3 (75.0, 4)	3 (100, 3)	1 (25.0, 4)
		No	61.9 (10.3, 48)	22 (45.8, 48)	31 (66.0, 47)	21 (43.8, 48)	17 (35.4, 48)
No dominance	Curative	Yes	56.4 (11.4, 11)	4 (36.4, 11)	9 (81.8, 11)	4 (36.4, 11)	5 (45.5, 11)
		No	52.0 (14.6, 65)	33 (50.8, 65)	52 (82.5, 63)	21 (32.8, 64)	25 (39.1, 64)
	Palliative	Yes	67.0 (11.9, 4)	2 (50.0, 4)	2 (50.0, 4)	2 (50.0, 4)	2 (50.0, 4)
		No	61.8 (9.9, 48)	23 (47.9, 48)	32 (68.1, 47)	22 (46.8, 47)	16 (33.3, 48)
Relative length of the past	Curative	Short	50.1 (14.4, 42)	18 (42.9, 42)	32 (78.0, 41)	19 (45.2, 42)	19 (46.3, 41)
		Long	55.6 (11.8, 43)	21 (48.8, 43)	38 (90.5, 42)	12 (28.6, 42)	15 (34.9, 43)
	Palliative	Short	64.1 (9.4, 26)	13 (50.0, 26)	17 (65.4, 26)	13 (52.0, 25)	5 (19.2, 26)
		Long	60.4 (9.5, 25)	15 (60.0, 25)	18 (72.0, 25)	9 (36.0, 25)	11 (44.0, 25)
Relative length of the present	Curative	Short	51.8 (13.5, 48)	22 (45.8, 48)	42 (91.3, 46)	18 (38.3, 47)	23 (48.9, 47)
		Long	54.2 (13.4, 37)	17 (45.9, 37)	28 (75.7, 37)	13 (35.1, 37)	11 (29.7, 37)
	Palliative	Short	64.4 (10.1, 20)	13 (65.0, 20)	15 (75.0, 20)	10 (52.6, 19)	7 (35.0, 20)
		Long	61.0 (9.1, 31)	15 (48.4, 31)	20 (64.5, 31)	12 (38.7, 31)	9 (29.0, 31)
Relative length of the future	Curative	Short	58.6[b] (12.1, 30)	17 (56.7, 30)	24 (82.8, 29)	7 (24.1, 29)	5[b] (16.7, 30)
		Long	49.7 (13.1, 55)	22 (40.0, 55)	46 (85.2, 54)	24 (43.6, 55)	29 (53.7, 54)
	Palliative	Short	60.9 (9.8, 38)	21 (55.3, 38)	26 (68.4, 38)	12[b] (31.6, 38)	13 (34.2, 38)
		Long	66.3 (7.7, 13)	7 (53.8, 13)	9 (69.2, 13)	10 (83.3, 12)	3 (23.1, 13)
Speed of time	Curative	Slow	51.7 (13.9, 42)	20 (47.6, 42)	34 (82.9, 41)	20 (47.6, 42)	17 (41.5, 41)
		Fast	54.5 (13.1, 53)	23 (43.4, 53)	45 (86.5, 52)	17 (32.7, 52)	23 (43.4, 53)
	Palliative	Slow	63.5 (9.5, 42)	20 (47.6, 42)	28 (68.3, 41)	24 (58.5, 41)	10 (23.8, 42)
		Fast	61.1 (10.4, 18)	10 (55.6, 18)	11 (61.1, 18)	7 (38.9, 18)	7 (38.9, 18)

Length of past, present, or future was computed "short" if a patient scored the median (calculated for all patients) or less and "long" if a patient scored greater than the median. Speed of time was computed "slow" if a patient scored the median (calculated for all patients) or less and "fast" if a patient scored greater than the median.

[a]Significant difference between low and high scores, $P < .05$.

[b]Significant difference between low and high scores, $P < .01$.

Table 3 • Partial Correlations Between Measures of Time Perspective and Measures of Quality of Life, Depression, and Hopelessness

		Time Coherence: Discrete		Time Coherence: Continuity		Past Dominance		Present Dominance		Future Dominance		No Dominance		Relative Length of the Past		Relative Length of the Present		Relative Length of the Future		Speed of Time	
		Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal
Satisfaction with life	*r*													−0.219	−0.442			0.304	0.268		
	P													.064	.006			.009	.109		
Global health status	*r*																			0.213	0.575
	P																			.055	.000
Physical functioning	*r*					0.325	0.340														
	P					.009	.046														
Role functioning	*r*																				
	P																				
Social functioning	*r*																			0.139	0.508
	P																			.212	.001
Emotional functioning	*r*																	0.332	0.176	0.078	0.561
	P																	.004	.298	.485	.000
Cognitive functioning	*r*																				
	P																				
Fatigue	*r*																				
	P																				
Nausea and vomiting	*r*																				
	P																				
Pain	*r*																				
	P																				
Dyspnea	*r*																				
	P																				
Appetite loss	*r*																				
	P																				
Constipation	*r*																			−0.043	−0.414
	P																			.701	.008
Diarrhea	*r*																				
	P																				
Financial problems	*r*																				
	P																				
Depression	*r*																	−0.358	−0.412	−0.037	−0.555
	P																	.002	.011	.741	.000
Hopeless ness	*r*					−0.284	−0.498	0.057	0.479					0.158	0.434			−0.370	−0.395		
	P					.023	.002	.655	.004					.184	.007			.001	.015		

Abbreviations: Cur, curative; Pal, palliative.

Partial correlation coefficient *r* for both the cancer patients without evidence of disease and advanced cancer patients is given if $r > 0.300$ and $P < .01$ in at least 1 of both groups. As only a minority of patients (<5%) adhered to an integrated vision of past, present, and future, patient numbers were too small to be taken up in the correlation analysis. Control variables were age, living with a partner, education, and employment.

Table 4 • Stepwise Regression Analysis of Measures of Time Perspective and Measures of Quality of Life, Depression, and Hopelessness

Dependent Variable	Group	Model	Independent Variables	Standardized Coefficient β	P	R^2 Change	R^2	Adjusted R^2
Satisfaction with life	Curative	1	Relative length of the future	.331	.003	0.109[a]	0.109	0.098[a]
		2	Relative length of the future	.325	.002	0.048[b]	0.157	0.135[a]
			Living with a partner	−.218	.039			
	Palliative	1	Relative length of the past	−.338	.018	0.114[b]	0.114	0.095[b]
Global health status	Palliative	1	Speed of time	.564	.000	0.318[c]	0.564	0.305[c]
Physical functioning	Curative	1	Education	.314	.008	0.099[a]	0.099	0.086[a]
		2	Education	.310	.006	0.074[b]	0.173	0.149[a]
			Past dominance	.273	.016			
Social functioning	Palliative	1	Speed of time	.335	.013	0.112[b]	0.112	0.095[b]
		2	Speed of time	.317	.015	0.082	0.194	0.162[a]
			Living with a partner	.287	.027			
Emotional functioning	Curative	1						
	Palliative	1	Speed of time	.524	.000	0.275[c]	0.275	0.261[c]
Constipation	Palliative	1	Speed of time	−.337	.011	0.114[b]	0.114	0.097[b]
Depression	Curative	1	Relative length of the future	−.251	.025	0.063[b]	0.063	0.051[b]
		2	Relative length of the future	−.414	.000	0.082[a]	0.145	0.122[a]
			Age	−.329	.009			
	Palliative	1	Speed of time	−.548	.000	0.300[c]	0.300	0.286[c]
Hopelessness	Curative	1	Relative length of the future	−.298	.007	0.089[a]	0.089	0.078[a]
	Palliative	1	Relative length of the past	.465	.002	0.216[a]	0.216	0.196[a]
		2	Relative length of the past	.406	.003	0.161[a]	0.377	0.345[c]
			Age	−.405	.003			
		3	Relative length of the past	.234	.089	0.102[b]	0.478	0.437[c]
			Age	−.475	.000			
			Past dominance	−.364	.010			

Stepwise regression analysis was performed of measures of time perspective on relevant measures of quality of life, depression, and hopelessness as determined from the correlation analysis (see Methods). Patient age, living with a partner, education, and employment were entered in each model as independent relevant sociodemographic variables. Per outcome variable, all significant models are shown with the independent variables, which were entered successively.

[a] $P < .01$.

[b] $P < .05$

[c] $P < .001$.

all observed in the group of advanced cancer patients. Speed of time remained a significant predictor for these QOL variables in the regression analyses. The associations of speed of time with these variables all indicated that when the week was experienced shorter (ie, the speed of time higher), less distress was reported (better physical, social, and emotional functioning; less symptoms of constipation; and less depression).

Temporal extension, more specifically relative length of the future, was the second measure of time perception that was frequently associated with measures of distress, that is, with satisfaction with life, emotional functioning, depression, and hopelessness. These associations were all observed in the group of cancer patients without evidence of disease. Except for emotional functioning, relative length of the future remained a significant predictor for these variables in the regression analyses. The associations of relative length of the future with these variables all indicated a beneficial relation with patient's distress: the longer the relative length of the future was indicated, the better satisfaction with life and emotional functioning, and the less depression and hopelessness were reported.

In the group of patients with advanced cancer, the relative length of the past was negatively associated with satisfaction with life and positively with hopelessness, which indicates that the longer the past was estimated to be, the less satisfaction with life and the more hopelessness was reported. Similarly, if the past was the dominant time segment for advanced cancer patients, higher levels of hopelessness were reported, whereas if the present was the dominant time segment, less hopelessness was reported. For cancer patients without evidence of disease, lower levels of physical functioning were reported if the past was the dominant time segment. Except for the relation of present dominance with hopelessness, these associations all remained significant in the regression analyses.

Research Question 3: Do Relations Between Time Perception and Distress Differ Between Curative and Palliative Patients?

To assess whether a significant partial correlation coefficient identified in 1 patient group was significantly different from the partial correlation coefficient in the other patient group, we used Fisher r-to-Z formula (Table 5). In the group of patients with advanced cancer, all associations of speed of time with measures of QOL (global health status, social functioning, emotional functioning, constipation, and depression) were significantly different from the group of cancer patients without

evidence of disease. Also, the relation between present dominance and hopelessness in the group of advanced cancer patients was significantly different from the group of cancer patients without evidence of disease. In the group of cancer patients without evidence of disease, the observed correlations were not significantly different from the group of advanced cancer patients.

■ Discussion

To the best of our knowledge, this is the first comparative study of time perception, QOL, depression, and hopelessness in a group of cancer patients without evidence of disease and a group of advanced cancer patients who did not receive anticancer treatment anymore and were facing death.

Time Perception in Cancer Patients

Both cancer patients without evidence of disease and advanced cancer patients had a similar view on time coherence. Both groups merely adhered to a discrete vision on past, present, and future, which reflects the experience that time consists of a succession of states, largely independent of each other. The traces of the past disappear very quickly, and each instant of time brings something new. In contrast, a vision of continuity or integration, which was adhered to by only a minority of patients, presupposes that events do not just occur one-by-one successively in the course of time, but that certain past events contribute to the development of others in the future and that new events may shed light on events of the past. It reflects the idea that the past and the future are contained in the present. The idea of continuity or integration may be compared with the "plot" of a story. In the configuration of the plot, multiple events are not just put in temporal succession, but are integrated into 1 comprehensible story.[16,31] Although a direct comparison with healthy volunteers is lacking in our study, the discrete vision of past, present, and future in our patient population may suggest that it may be hard for patients to view the events in their lives as a coherent whole. This appeared not only to be the case for the advanced cancer patients where cancer would ultimately disrupt the flow of life and thus of time,[13,32] but also in the cancer patients without evidence of disease. In fact, in a qualitative study in cancer survivors, respondents reported that the diagnosis of cancer had disrupted their experience of time.[14] Even though in the "no evidence of disease group" patients may not die of cancer, cancer has irrevocably interrupted the flow of time for them, too. After having completed treatment, survivors still have to deal with the cancer diagnosis and the fear of recurrence and are faced with issues such as sense of "loss of control" of their life, increased health worries, loss of energy, tiredness, sexuality and infertility problems, anxiety, and depression.[33] In the words of a cancer survivor: "It is definitely a new time. There is the time before I became ill and the time after."[14]

A significant difference between cancer patients without evidence of disease and advanced cancer patients was observed for

Table 5 • Fisher *r*-to-*Z* Analysis of Correlation Coefficients

		Time Coherence: Discrete		Time Coherence: Continuity		Past Dominance		Present Dominance		Future Dominance		No Dominance		Relative Length of the Past		Relative Length of the Present		Relative Length of the Future		Speed of Time	
		Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal	Cur	Pal
Global health status	*r*																			0.213	0.575
	P																			.055	.000
Social functioning	*r*																			0.139	0.508
	P																			.212	.001
Emotional functioning	*r*																			0.078	0.561
	P																			.485	.000
Constipation	*r*																			−0.043	−0.414
	P																			.701	.008
Depression	*r*																			−0.037	−0.555
	P																			.741	.000
Hopelessness	*r*							0.057	0.479												
	P							.655	.004												

Abbreviations: Cur, curative; Pal, palliative.
Partial correlation coefficients are indicated that were significantly different between the curative and palliative patient group according to Fisher *r*-to-*Z* formula.

time dominance: the future was dominant in the "no evidence of disease" group, whereas the present was dominant in the "advanced cancer" group. Similar results were obtained for temporal extension: the relative length of the future was longer in the group of patients without evidence of disease, whereas the relative length of the present was longer in the group of patients with advanced cancer. At first sight, these results do not seem unexpected: patients without evidence of disease have conquered cancer and have good reasons to leave behind the difficult times and look for new chances into the future. In contrast, patients with advanced disease know that the times ahead are limited, and therefore for them it is of no use to concentrate on the future. Despite its appeal, this explanation may need to be nuanced, as it does not explain why in patients with advanced disease the present is dominant, rather than the past. The observed relation between time dominance and distress may shed further light on this issue, as discussed below. The significant difference in the experience of the speed of time between the cancer patients without evidence of disease and advanced cancer patients is also discussed in the light of the experience of distress.

Time Perception and Distress

In the group of cancer patients without evidence of disease, the longer the relative length of the future was drawn on the life line, the less distress was reported. Although in the advanced cancer group the association between relative length of the future and distress did not meet our preset criteria of significance, the results pointed toward a similar conclusion, and Fisher *r*-to-*Z* formula did not indicate a significant difference between the "no evidence of disease" and "advanced cancer" group in this respect. Vice versa, in the group of patients with advanced cancer, the longer the relative length of the past was indicated, the more distress was reported, and this relation was not significantly different from the results in the group of patients without evidence of disease. This implies, first of all, that having some kind of future perspective is essential for patients, both in the curative and in the palliative setting. Even though the advanced cancer patients are very well aware that their future life span is limited (on average, the relative length of the future was shorter in the advanced cancer group than in the group of patients without evidence of disease), if they have a perspective of at least some time ahead, this may be associated with less distress. These results also imply that having one's focus primarily on the past may not be beneficial for patients. This is illustrated by previous studies in terminally ill cancer patients, which showed that life reviews may be beneficial.[34,35] In life reviews, the past is reviewed with questions such as, "What is the most important thing in your life and why?" "What are the most vivid or impressive memories in your life?" However, in this review process, the present and future are also incorporated with questions such as, "Is there anything about you that your family needs to know?" "Are there things you want to tell them, and are there things you want them to remember?" "What advice or words of guidance do you have for the important people in your life or for the younger generation?"[35] In this way, patients are assisted in maintaining a sense of purpose in life and thus a focus on the present and even the future, which is concordant with their changed circumstances.[36]

In the group of patients with advanced cancer, speed of time was experienced significantly different from the group of patients without evidence of disease: the past week had seemed significantly longer to advanced cancer patients. Looking at the association between speed of time and distress (the slower time seemed to move, the more distress was reported), the difference between patients with advanced cancer and patients without evidence of disease could be explained by differences in distress levels.[17,18] As we have shown previously, patients with advanced cancer reported higher levels of distress than patients without evidence of disease.[22] Interestingly, the correlation between speed of time and distress was observed in the group of advanced cancer patients only and was significantly different from the group of patients without evidence of disease. This may be understood from the cognitive information processing point of view as, in case of distress, time intervals may be perceived as lengthened (ie, speed of time seems to slow down) compared with normal.[19–21] However, when distress is absent, this does not necessarily lead to a speeding up of time compared with normal.

Limitations

The results of this study should be interpreted with caution. A mixed convenience sample was used with a variety of cancer diagnoses. In the group of advanced cancer patients, 56% of the patients returned and sufficiently completed the questionnaire. Although this percentage is reasonably good considering the patients' phase of life, a selection bias may be present. Therefore, generalization of the results beyond the sample of this study is restricted. Because our patient groups were rather small, subtle differences between the groups or small but relevant associations between time perception and distress may have remained undetected.

Implications for Practice and Research

As time surrounds and embeds all human behavior, it requires special consideration within nursing, which is constantly concerned with human behavior in all its aspects.[37] For professional caregivers, it is important to realize that the diagnosis of cancer may have a large impact on a patient's time perception. Although patients with advanced cancer may be less future oriented than cancer patients without evidence of disease, for both groups a primary focus on the past may not be beneficial. In fact, it may be necessary for oncology nurses or other healthcare professionals to actively intervene in a patient's time perception.[11] However, as mentioned above, given the small sample size of our study, the generalization of our results is difficult. Therefore, as a first step for further research, we would suggest a replication of our findings in a larger patient sample. Then, a prospective intervention study should be conducted investigating whether interventions focusing on the past have different effects on patients' well-being than interventions focusing on the present or future. Meanwhile, nurses may explore

the current communication of patients with family and friends and assist patients to tie the loose ends of their lives.

As nurses are in a key position to incorporate psychosocial care in their daily practice, thereby diminishing patients' distress,[38] being attentive to signs and symptoms of distress in daily nursing practice is of great importance, along with formal evaluations of distress. Based on our results, nurses, specifically in a palliative care setting, should be aware that, if patients experience time as dragging, this may be a sign of distress, and a further exploration of patients' distress may be warranted.

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