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# Provider caring and structuring treatment information to improve cancer patients' recall: Does it help?

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ABSTRACT

*Objectives:* Patient recall of medical information is usually poor. Healthcare providers can employ affect-oriented (i.e., showing care) or cognition-oriented communication styles (i.e., structuring information) to enhance recall, but research evidence is limited especially among clinical and/or older patient populations. This video-vignette study manipulated provider caring and information structuring to examine effects on recall and trust among cancer patients/survivors.
*Methods:* In an online survey, 148 participants ($M_{age}$ = 62) were randomized to one of four video conditions in a two (standard communication vs. enhanced caring) by two (standard vs. enhanced structuring) design, and completed measures of active recall, recognition, and trust.
*Results:* Increased caring or structuring did not enhance active recall or recognition, instead both were higher among younger, female, or highly educated participants. The caring condition induced higher perceived trust in the provider within the whole sample, but trust was significantly correlated with decreased recall ($r$ = −.268) among younger participants.
*Conclusions:* Provider caring can strengthen the patient-provider relationship by enhancing trust. Yet, increased trust may impair recall among younger patients. Structuring treatment information did not enhance recall and recognition, but additional research is needed.
*Practice implications:* Providers may use additional ways of structuring/organizing information to help enhance recall (e.g., written information).



## 1. Introduction

Cancer patients desire extensive treatment-related information [1], especially about possible symptoms and side effects of treatment in the short- and long-term [2–4]. The ability to anticipate potential symptoms and the course of treatment can provide patients with a sense of control and may enable adjustment to physical and/or psychological demands of cancer treatment [5,6]. However, research has repeatedly shown that cancer patients' recall of medical information is poor [7–10], as they forget about 40–80% of information provided by health care providers [7,11–13]. In turn, ill-informed patients can have difficulties making informed decisions and managing their disease [6]. Thus, effective information provision is essential to providing comprehensive care in oncology.

Certain communication strategies have been suggested to improve the effectiveness of medical information provision, including affect- and cognition-oriented strategies [14–16]. Such strategies should be considered jointly in oncology, as there is an inherent interplay between cognitive and emotional aspects of processing cancer-related information [17,18]. *Affect*-oriented

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communication strategies are, for example, physician behaviors that convey empathy, compassion, or emotional engagement with the patient [12,19–24]. Such behaviors were found to reduce patients' distress [12,19,24,25] and increase trust in providers [20]. Importantly, provider affect-oriented communication, such as expressing caring behaviors, was found to enhance patients' memory of information [12,23,26]. Moreover, *cognition*-oriented communication strategies are also aimed at enhancing patients' cognitive outcomes, such as information recall [27–31]. One such strategy is information structuring. Structure allows individuals to systematically organize and store information in their working memory, thereby making it easier to remember [29]. Providers can use verbal signals to guide patients through presented information, such as setting an agenda, using numeric signals, or phrases to indicate summaries [32]. Clarity and structure of information have been identified as a powerful means to improve (school) learning [33], and structuring/organizing medical information is recommended for oncology care providers [34]. However, only few studies have systematically examined the effect of information structuring on patients' recall of information in the context of a medical consultation: Two studies among medical or psychology students, showed that structuring information enhanced recall [29,35], whereas a third study did not find such effects. Instead this study reported that prior medical knowledge determined greater recall [36]. Another two studies among mixed samples of university students and adults showed improved recall due to organizing information in one [27], but not the other study [31]. Given these mixed findings and overrepresentation of young university students, the effects of information structuring on recall remain poorly understood, especially in clinical populations. Furthermore, these studies focused on active recall (i.e., reproducing information entirely from memory), which is different from recognizing information. Previous studies showed that actively reproducing information yields less correct information than recognizing correct answers [37,38].

Importantly, many cancer patients are diagnosed in later adulthood, calling for research that examines mechanisms to improve information provision and recall specifically in older individuals [39]. Studies conducting focus groups with cancer patients and professionals reported that participants believed that structuring information is helpful when providing information to older cancer patients [40], but research regarding age effects on patients' recall of information from medical consultations is limited. It was indicated that older cancer patients may be less equipped to fully process complex treatment-related information [39], due to a cognitive decline inherent to the aging process [41]. Older patients seem to need more visual cues than younger patients to recall information [42], and they can more easily be overwhelmed by too much information (i.e., the more information is provided, the smaller the proportion they remember [11]). Additionally, positive affect-oriented communication can particularly enhance information recall among older adults [39,43], as they show greater attention to positively valenced stimuli [44]. Thus, recall may be specifically improved among older adults if both affect- and cognition-oriented communication strategies are enhanced.

This study aimed to test if an affect-oriented communication style like provider *caring* enhances trust (Hypothesis: $H_1$) as well as active recall and recognition of cancer-related treatment information ($H_2$). It was further tested if a cognition-oriented style like information *structuring* enhances recall and recognition ($H_3$), and whether recall and recognition are particularly enhanced if providers exhibit both *caring* and *structuring* communication styles (i.e., interaction effect, $H_4$). The potential role of age, along with other background factors (e.g., prior medical knowledge) will be explored (Research question: $RQ_1$).

## 2. Methods

### 2.1. Study design and video vignettes

Manipulating information provision in clinical practice is usually inappropriate due to ethical and practical considerations, which is why video-vignette experiments are frequently used to standardize and systematically manipulate (provider) behaviors across experimental conditions [26,45–50]. Video vignettes in medical settings are scripted scenarios of real-life consultations, and participants are asked to imagine themselves being the patient in the video, serving as so-called "analogue patients" [51]. The validity of this method has been demonstrated [48,52,53]. In the present study, mainly cancer patients/survivors served as analogue patients to increase external validity and to test effects in a clinical population. A small proportion of participants (8.8%) were healthy individuals who frequently engage with cancer patients/survivors (e.g., partners, relatives, close friends). Previous studies reported similar results if patients versus healthy/disease-naïve individuals served as analogue patients [19,48,53–55].

This study was part of a larger experimental protocol (Fig. 1) and additional details about the study protocol and development of video vignettes have been published elsewhere [56]. Our video vignettes showed a patient-provider conversation about the intended treatment plan of a recently diagnosed lymphoma patient (e.g., rounds of chemotherapy, potential side effects). The presented experiment employed a between-subjects factorial design where provider *caring* and information *structuring* were systematically manipulated, resulting in a two (standard vs. enhanced caring) by two (standard vs. enhanced structuring) study design (Fig. 1). All video vignettes showed the same basic conversation which was altered for each condition: Signs of *caring* included utterances that validated the video patient's emotional burden and conveyed understanding (e.g., *I can imagine that you're worried; I understand that this is a tough and uncertain period for you*). Four different signs of *structuring* were used [32,57], which were verbal signals that (a) introduced a certain topic/agenda (e.g., *In today's consultation, I would like to discuss . . .*), (b) introduced a summary, (c) used numeric signals (e.g., *first, . . . second, . . .*), and (d) visual signs such as finger/hand signals when counting/using numeric signals.

Videos were embedded in an online survey, where participants provided background information first (i.e., age, sex, marital status, level of education, work status, cancer status, prior medical knowledge; Table 1). Afterwards, they were automatically randomized to one of four video vignettes (Fig. 1), and subsequently evaluated the videos and completed a series of questions assessing outcomes of interest.

### 2.2. Participants

Participants were invited by mass emails sent through an online platform for patient-provider research (www.panelcom.nl) and a commercial online research platform (www.flycatcher.eu). Additionally, our survey was advertised on homepages/social media profiles of cancer support organizations (i.e., the Dutch Cancer Society [KWF], Hematon, the Dutch Federation of Cancer Patient Organizations [NFK]). All procedures were approved by the medical ethical committee of the Amsterdam University Medical Center (W16_054#16.069).

A total of $N = 163$ participants were randomized to one of the four video vignettes and $N = 148$ completed all questions (90.8%; Fig. 1). The 148 participants were 26-81years old (median, $Mdn = 62$years), predominantly partnered/married (81.1%), highly educated (54.1%), and both sexes were equally represented (50.0%).

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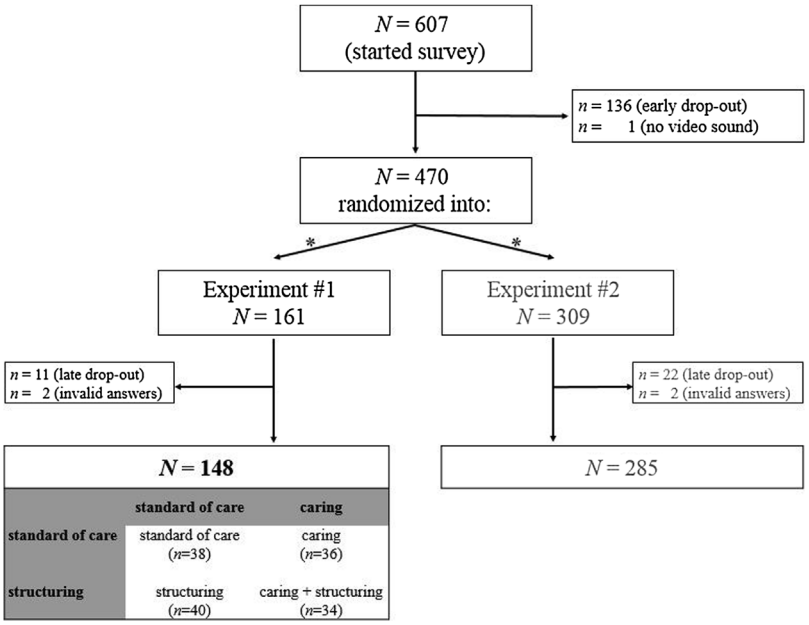


**Fig. 1.** Inclusion and randomization of participants.
*The full study protocol consisted of two separate experiments. One third of participants ($n$ = 161/470) was randomized to experiment #1, which is described in this manuscript. For comparisons of included vs. dropped-out participants, all drop-outs were combined (i.e., early and late dropped out participants, $n$ = 174).

Most participants were cancer patients/survivors (91.2%) with time since diagnosis ranging from <1–41 years ($M$ = 6.3years, Table 1). These 148 participants did not differ from participants who discontinued participation (Fig. 1), except for their age: Completers were younger ($M\Delta$ = 3.8years, $p$ = .002) and consequently less likely to be retired (41.2% vs. 56.4%, $p$ = .006).

### 2.3. Measures

#### 2.3.1. Evaluations of the video consultation

The 15-item Video Engagement Scale (VES), a frequently-used tool in video-vignette research, assessed participants' emotional engagement and involvement with the video vignette [58]. Items include statements about whether participants exclusively focused on the video, could connect with the video patient, or were touched by the video. Items are answered on a 7-point Likert scale (*disagree – agree*), and scores were averaged with higher scores indicating greater engagement.

To assess whether video manipulations were successful we used one item each to assess the extent to which participants in the different conditions *perceived* provider caring and information structure to be present. Specifically, participants were asked to rate the extent to which they perceived the provider as caring, using the item: "*On a scale from 1 to 10, to what extent do you think the doctor communicated in an understanding and empathetic manner, for example by utterances of sympathy and compassion;"* and to rate the extent to which the physician structured the provided information, using the item: "*On a scale from 1 to 10, to what extent do you think the doctor structured the information provided in the video, for example by enumerating, announcing, repeating, or summarizing information.*"

#### 2.3.2. Primary outcomes

The 5-item short version of the Trust in Oncologist Scale (TiOS-SF [59]) was used to measure whether the provider was perceived as evoking trust among participants. Each item was rated on a 5-point Likert scale ranging from *completely disagree – completely agree*, and mean scores were calculated.

Two aspects of recall, that is active recall and recognition, were measured in this study. Both were based on the Netherlands Patient Information Recall Questionnaire [38] and their development was described in the full study protocol [56]. Active recall was measured with 14 open-ended questions inquiring about information presented in the video vignette (e.g., patient's type of cancer, type of treatment, potential side effects). Participants either typed their answer into an open-ended text box or indicated they did not know the answer. A detailed scoring scheme was developed and all answers were coded by two coders independently with an inter-rater reliability of 95.5%. If coders disagreed, final scoring was achieved through discussion. To standardize recall, participants' scores were transformed into percentages.

Following active recall, the same 14 questions about the video vignette were presented in a multiple-choice format to measure recognition. Each question included three answer options, and participants could gain one point for each correct answer, which was again standardized into percentages.

### 2.4. Statistical analyses

A priori power analyses indicated a necessary sample size of $N$ = 180 to detect medium effects, and with a final sample of $N$ = 148, we had sufficient power (>.7) to detect medium to large effects. Successful randomization was tested by comparing participants' background characteristics between video conditions, using $t$- or $\chi^2$-tests, as appropriate. ANOVAs were used to test differences between video conditions regarding participants' engagement with the video vignettes and whether participants detected the video manipulations (i.e., comparing *perceived* caring and *perceived* structuring).

Main effects of the caring video condition on perceptions of trust were tested using an ANOVA ($H_1$). Main effects of the caring video condition ($H_2$), the structuring condition ($H_3$), and their interaction ($H_4$) on active recall were tested using an ANOVA; followed by repeating this analysis as ANCOVA, including age as covariate ($R_1$). Age was tested as both continuous and categorical

**Table 1**
Background characteristics for the whole sample and by age groups.

| | whole sample $N = 148$ | age: ≤62 $n = 77$ | age: >62 $n = 71$ | comparison | $p$ |
|---|---|---|---|---|---|
| **age** | 61.8 (10.1), 26–81 | 53.8 (7.0), 26–62 | 69.8 (5.0), 63–81 | – | – |
| **sex** | | | | $\chi^2(1) = 16.92$ | **<.001** |
| male | 74 (50.0%) | 26 (33.8%) | 48 (67.6%) | | |
| female | 74 (50.0%) | 51 (66.2%) | 23 (32.4%) | | |
| **nationality** | | | | – | – |
| Dutch | 145 (98.0%) | 75 (97.4%) | 70 (98.6%) | | |
| other | 3 (2.0%) | 2 (2.6%) | 1 (1.4%) | | |
| **marital status** | | | | $\chi^2(1)=0.03$ | .856 |
| partnered/married | 120 (81.1%) | 62 (80.5%) | 58 (81.7%) | | |
| single | 28 (18.9%) | 15 (19.5%) | 13 (18.3%) | | |
| **education**[*] | | | | $\chi^2(2) = 7.42$ | **.025** |
| low | 34 (23.0%) | 13 (16.9%) | 21 (29.6%) | | |
| middle | 34 (23.0%) | 24 (31.2%) | 10 (14.1%) | | |
| high | 80 (54.0%) | 40 (51.9%) | 40 (56.3%) | | |
| **work status** | | | | – | – |
| employed | 57 (38.5%) | 51 (66.2%) | 6 (8.5%) | | |
| unemployed | 30 (20.3%) | 25 (32.5%) | 5 (7.0%) | | |
| retired | 61 (41.2%) | 1 (1.3%) | 60 (84.5%) | | |
| **cancer status** | | | | $\chi^2(1)=0.52$ | .472 |
| patient/survivor | 135 (91.2%) | 69 (89.6%) | 66 (93.0%) | | |
| relative/close person[+] | 13 (8.8%) | 8 (10.4%) | 5 (7.0%) | | |
| **cancer knowledge** | | | | $\chi^2(2)=0.25$ | .883 |
| little | 33 (22.3%) | 16 (20.8%) | 17 (23.9%) | | |
| moderate | 84 (56.8%) | 45 (58.4%) | 39 (54.9%) | | |
| a lot | 31 (20.9%) | 16 (20.8%) | 15 (21.1%) | | |
| **cancer type** | | | | – | – |
| hematological | 40 (29.6%) | 29 (42.0%) | 11 (16.7%) | | |
| gastro-intestinal | 29 (21.5%) | 9 (13.0%) | 20 (30.3%) | | |
| breast | 26 (19.3%) | 17 (24.6%) | 9 (13.6%) | | |
| urological | 18 (13.3%) | 2 (2.9%) | 16 (24.2%) | | |
| reproductive organs | 6 (4.4%) | 4 (5.8%) | 2 (3.0%) | | |
| other | 16 (11.9%) | 8 (11.6%) | 8 (12.1%) | | |
| **age at diagnosis**[#] | 55.7 (11.4), 12–78 | 48.2 (9.2), 12–61 | 63.8 (7.1), 36–78 | $t(129) = -10.78$ | **<.001** |
| **years since diagnosis**[#] | 6.3 (6.3), 0–41 | 6.5 (6.3), 0–33 | 6.1 (6.3), 0–41 | $t(129)=0.34$ | .736 |

All correlations are accompanied by their p-values, and those who are significant are printed in bold.
[*] low = vocational training or lower, middle = continued education, high = university/ university of applied sciences degree.
[+] partner, relative, or close friend of a cancer patient/survivor.
[#] missing: $n = 4/135$.

covariate (i.e., using the median age of 62 years to split the sample into younger (≤62) vs. older participants (>62)). Potential differences in recall based on participants' prior medical knowledge and level of education were tested and, if significant, added to the ANCOVA on recall ($R_1$). Finally, the same steps for testing $H_2$-$R_1$ were followed to examine effects on recognition.

## 3. Results

### 3.1. Randomization and manipulation checks

Randomization was successful as participants in the experimental conditions did not differ by any background characteristic (as listed in Table 1,$ps > .159$), and all participants rated their engagement with the video similarly across conditions ($M \approx 4.6$ in all conditions, $ps > .500$).

Participants exposed to increased provider *caring* indeed detected this as such ($M = 7.0$ vs. 5.8 for perceived provider caring, $F(1,146) = 7.97$, $p = .005$, $\eta^2 = .052$). In contrast, participants exposed to enhanced information *structuring* did not perceive the viewed conversations as more structured than participants in the other condition (i.e., $M = 8.4$ vs. 8.0, $F(1,146) = 2.60$, $p = .109$, $\eta^2 = .017$). The vast majority (91.2%) of participants rated information structure as high (i.e., rating ≥7 on a scale of 1–10).

### 3.2. Trust

Supporting $H_1$, participants in the video conditions with enhanced *caring* reported significantly higher trust in the provider than participants who were not exposed to enhanced caring ($M = 4.0$ vs. 3.7, $F(1,146) = 6.82$, $p = .010$, $\eta^2 = .045$). No significant difference in trust was observed between the *structuring* conditions ($M = 3.8$ vs. 3.9, $F(1,146) = 0.61$, $p = .438$, $\eta^2 = .004$).

### 3.3. Active recall

On average, participants recalled 56.6% of provided information correctly, ranging from 7.4 to 87.0% (Table 2). Recall was neither enhanced by the caring condition ($F(1,144) = 3.83$, $p = .052$, $\eta^2 = .026$), the structuring condition ($F(1,144) = 1.19$, $p = .278$, $\eta^2 = .008$), nor their combination ($F(1,144) = 1.27$, $p = .263$, $\eta^2 = .009$), providing no support for $H_2 - H_4$.

Addressing $RQ_1$, we repeated this ANOVA while controlling for age, which showed that active recall was significantly lower among older participants, while effects for the caring condition, structuring condition, and their interactions with age were non-significant. This was the case for both using age as a continuous ($F(1,142) = 18.32$, $p < .001$, $\eta^2 = .114$) and binary variable (i.e., median split at age 62; $M\Delta = 8.7\%$; $F(1,142) = 12.97$, $p < .0001$, $\eta^2 = .084$). To

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**Table 2**
Descriptive statistics of investigated concepts for the whole sample, and split by age.

| | whole sample $N = 148$ | age: ≤62 $n = 77$ | age: >62 $n = 71$ | comparison | $p$ |
|---|---|---|---|---|---|
| **evaluation of consultation** | | | | | |
| perceived structure | 8.2 (1.5), 2–10 | 8.2 (1.5), 2–10 | 8.1 (1.6), 1–10 | $t(146) = -0.27$ | .789 |
| perceived caring | 6.3 (2.6), 1–10 | 5.7 (2.7), 1–10 | 7.0 (2.3), 1–10 | $t(146) = -3.14$ | **.002** |
| video engagement | 4.7 (1.4), 1.5–7 | 4.5 (1.4), 1.5–7 | 4.9 (1.3), 1.6–7 | $t(146) = -1.66$ | .098 |
| **outcomes** | | | | | |
| trust in physician | 3.8 (0.8), 1.4–5 | 3.6 (0.8), 2–5 | 4.0 (0.7), 1.4–5 | $t(146) = -2.97$ | **.003** |
| active recall | 15.3 (4.3), 2–23.5 | 16.4 (3.9) 3–22.5 | 14.1 (4.3), 2 – 23.5 | $t(146) = 3.52$ | <**.001** |
| recognition | 12.3 (1.5), 7–14 | 12.8 (1.2), 9–14 | 11.7 (1.6), 7–14 | $t(146) = 4.49$ | <**.001** |

All correlations are accompanied by their p-values, and those who are significant are printed in bold.

further explore age effects, we tested whether it was related to other background factors (Table 1). This showed that younger participants were significantly more often female (66.2% vs. 33.8% males, $\chi^2(1) = 16.92$, $p < .001$) and had significantly more often completed a mid-level education ($\chi^2(2) = 7.42$, $p = .025$; Table 1).

In further addressing $R_1$, we tested whether recall was related to self-reported prior medical knowledge or level of education. Analyses showed no significant effects of prior knowledge, but education: Participants with middle or high levels of education had higher recall scores than those with a lower education ($M = 57.5\%$ and 60.8% vs. 46.1%, $F(2,145) = 11.94$, $p < .001$). Thus, we ran the final ANCOVA combining the above factors (i.e., age, sex, education, caring condition, structuring condition, and the interaction of caring and structuring, while controlling for trust) showing only two main effects: Male (vs. female, $F(1,139) = 19.07$, $p < .001$, $\eta^2 = .121$) or lower educated participants (vs. middle/high, $F(2,139) = 13.23$, $p < .001$, $\eta^2 = .160$) had significantly lower recall scores. The overall model explained 32.5% of the total variance in recall scores (adjusted $R^2 = .286$). Note that trust was not significant in this analysis, but bivariate correlations indicated a weak negative association of increased trust being related to decreased recall among younger participants ($r = -.268$, $p < .001$; Table 3).

Given that the video conditions were unrelated to recall, we explored whether recall was related to participants' perceptions of the vignettes. Specifically, recall was unrelated to participants' *perceived* structuring ($r = -.036$, $p = .664$), but significantly and negatively related to *perceived* caring ($r = -.264$, $p = .001$) in the whole sample. However, when split by age this correlation was only found among younger participants ($r = -.274$, $p = .016$; Table 3), indicating that greater perceived caring was related to significantly decreased recall among younger participants only.

### 3.4. Recognition

Participants recognized about 87.6% of provided information correctly (50.0–100.0%; Table 2), and recognition was moderately correlated with active recall ($r = .655$, $p < .001$). Similar to recall, recognition scores did not significantly differ by the caring condition ($F(1,144) = 0.19$, $p = .278$, $\eta^2 = .001$), structuring condition ($F(1,144) = 0.01$, $p = .957$, $\eta^2 < .001$), or their interaction ($F(1,144) = 0.67$, $p = .416$, $\eta^2 = .005$), providing no support for $H_2$–$H_4$.

Controlling for age yielded again significant results, indicating that older participants recognized less information correctly ($M\Delta = 7.4\%$); whereas recognition did not differ by prior medical knowledge or level of education ($RQ_1$). Therefore, the final ANCOVA included age, sex, caring, structuring, and the interaction of caring and structuring, while controlling for trust. Results indicated that participants who were younger (vs. older than 62, $F(1,141) = 9.73$, $p = .002$, $\eta^2 = .065$) and female (vs. male, $F(1,141) = 10.27$, $p = .002$, $\eta^2 = .068$) had significantly higher recognition scores. The overall explained variance was 18.4% (adjusted $R^2 = .149$). Finally, recognition was uncorrelated with trust or participants' perceptions of the consultations (Table 3).

**Table 3**
Correlations among investigated concepts within the whole sample and split by participant age.

| | | perceived structure | perceived caring | trust | active recall |
|---|---|---|---|---|---|
| **whole sample** | perceived structure | – | | | |
| | perceived caring | **.468** ($p < .001$) | – | | |
| | trust | **.462** ($p < .001$) | **.708** ($p < .001$) | – | |
| | active recall | −.036 ($p = .664$) | −**.264** ($p = .001$) | −**.216** ($p = .008$) | – |
| | recognition | .061 ($p = .462$) | −.042 ($p = .609$) | −.094 ($p = .255$) | **.655** ($p < .001$) |
| **age: ≤62** | perceived structure | – | | | |
| | perceived caring | **.388** ($p < .001$) | – | | |
| | trust | **.284** ($p = .012$) | **.621** ($p < .001$) | – | |
| | active recall | .019 ($p = .872$) | −**.274** ($p = .016$) | −**.268** ($p = .018$) | – |
| | recognition | .138 ($p = .230$) | .035 ($p = .764$) | −.093 ($p = .419$) | **.565** ($p < .001$) |
| **age: >62** | perceived structure | – | | | |
| | perceived caring | **.619** ($p < .001$) | – | | |
| | trust | **.692** ($p < .001$) | **.787** ($p < .001$) | – | |
| | active recall | −.099 ($p = .409$) | −.138 ($p = .250$) | −.052 ($p = .665$) | – |
| | recognition | −.003 ($p = .978$) | .067 ($p = .578$) | .057 ($p = .637$) | **.664** ($p < .001$) |

All correlations are accompanied by their p-values, and those who are significant are printed in bold.

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## 4. Discussion and conclusion

### 4.1. Discussion

This experimental video-vignette study showed that enhanced provider *caring* induced trust among participants. However and although weak, increased trust was also related to decreased recall among younger participants. This study further indicated little impact of providers' information *structuring* on participants' recall and recognition of medical information. Yet, it remains to be tested which role structuring itself versus people's appraisal of structure plays (see also below). Instead, younger age and female sex appeared to determine greater active recall and recognition, whereas higher education was related to recall, but not to recognition.

As expected and in line with previous research [20,60], this study showed that provider caring can enhance trust in providers, but it had no effect on recall. Instead, a negative yet weak association between *perceived* caring and recall was identified, which contradicted our expectations and previous studies, which reported improved recall if providers exhibited signs of caring [12,23,26]. Yet, these studies included young and/or healthy participants, which may at least partially account for such contrasting findings. In fact, one previous study [19] also reported a negative association between compassion and recall among older cancer survivors with a mean age of 50 years (which is comparable to the younger age group in this study). Interestingly, the authors interpreted their identified difference as not clinically meaningful because it was small [19], but we would like to offer another possible explanation: The video conditions of enhanced caring as well as perceived provider caring were related to increased trust. In turn, trust may serve as a means to rely on or even blindly trust the provider, and not question the suggested treatment plan/recommendations, thereby potentially decreasing recall. Such a reliance on providers could potentially be both detrimental and beneficial for patients: On the one hand, patients may fail to grasp important treatment-related information and can be less able to take part in shared decision-making. On the other hand, a trusting patient-provider relationship may also offer a peace of mind about the availability of a provider, opportunities to revisit questions later, and/or being more open about concerns. Interestingly, we did not find similar associations for recognition, which warrants further examination.

Providing structured information has been shown to be a powerful tool in improving (school) learning [33], it is recommended for oncology providers [34], and appreciated by cancer patients [40], but effects of *structure* on recall of medical information remain understudied in clinical populations. In line with two previous studies [31,36], yet in contrast to others [27,29,35], this study showed no effects of providing structured medical information on recall and recognition. Nevertheless, background factors such as younger age, female sex, and higher education were related to higher recall. The identification of these background factors could offer some insight into such mixed findings: Studies that have reported effects of structuring have been conducted among young, predominantly female, and highly educated university students [29,35], or included small samples and their findings may be incidental [27]. Thus, personal characteristics such as age, sex, and education are related to cognitive capacities [7,41,61], including information recall [11,42], and information structuring may add only little value on top of such generic factors. Nevertheless, cognitive abilities among aging individuals vary greatly, and more specific individual factors (e.g., cognitive fitness or motivation vs. chronological age) should be considered in the future. Additionally, most of our participants were highly educated and future research among low-literate patients is warranted.

Overall, this study highlights that participants had difficulty detecting the *absence* of structure, as they perceived structure to be high although the conditions had been designed to differ in this respect. That participants would not detect these manipulations was unexpected given that pre-tests during the development phase of this project showed significant effects, and the used structure signals were based on established theories [32,57]. Nevertheless, we argued that even in the absence of consciously detecting our manipulations, participants in the *structuring* conditions may be able to gather and store information more easily. Although we therefore still expected effects between conditions, it was not supported by our data. Open-ended text boxes alluded to participants' reasoning: They thought of the video consultation as clear, which they equated with being structured. Those who perceived little structure linked the absence of written information to an absence of structure. Structure was thus evaluated in ways that differed from our intentions, and possibly in ways that are more natural to older individuals. This could at least partially explain why participants in this study did not detect the structuring manipulations, as opposed to medical/psychology students in previous studies [29,35] who may be more versed in or critical about communication skills. It also needs to be noted that our video vignettes were about a treatment plan with a clear objective, which in itself can provide structure. Some participants indicated that too much information was discussed in our vignettes, and negative effects of providing too much information have indeed been reported previously [11]. Nevertheless, our video consultations closely resembled real-life situations in terms of length and type/amount of information, and were developed together with oncology care providers to enhance validity [56].

Although adding to the limited body of research on information structuring and recall in older clinical populations, several limitations need to be considered. First and although our sample was sizeable, only medium to large effects could be detected and replications in larger samples are needed. Second, the younger age group comprised a large age range of 26–62 years and more meaningful categorizations of, for example, young, middle, and older adulthood may be warranted, while considering prevalence rates of different types of cancer in various age groups may be important. Third, participants who completed this study were younger than non-completers which may be an indication that our survey was too demanding for older participants. Specifically the format of typing open-ended answers for active recall might be experienced as burdensome and time-consuming. Fourth, little variation was found in perceived structuring among participants, calling for more research into lay people's understanding of structure in patient-provider conversations and more pronounced manipulations of structuring, while attention should be paid to still letting such conversations appear realistic. Finally, while including cancer patients/survivors may be regarded as an asset of this study to increase external validity, watching the video vignettes may have caused various emotions and brought back memories, which in turn may have convoluted participants' recall/recognition (e.g., own treatment vs. video patient's treatment plan).

### 4.2. Conclusion

As indicated in previous research, patients tend to trust providers who are more caring [60]. However, in line with one other study among older cancer patients, we demonstrated that enhanced trust can decrease recall, and the specific implications of such relations need to be explored. Additionally, providing information in more structured ways did not increase recall and recognition among cancer patients/survivors in this study, although providing structured information is recommended in clinical practice [34]. Participants equated structure with clarity,

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and lay people's expectations of a structured medical conversation (vs. providing clear information) need to be considered more thoroughly. Importantly, our participants, along with previous research [40], indicated that other manners of providing structure or clarity (e.g., written information), involving relatives/partners [62], and the possibility to return to providers if needed may be helpful [63].

### 4.3. Practice implications

Medical information, especially cancer treatment-related information, can be lengthy, difficult to understand, and emotionally burdensome for patients and their relatives. Therefore, clinical care providers should consider the complexity and amount of information they want to share with patients, as well as goal(s) of a certain consultation to not overwhelm cancer patients/survivors. Age-adapted communication styles may be needed and it is essential to find a balance between adjusting information provision to older adults while avoiding to be patronizing [64]. Additionally, male and/or low-literate patients may need specific attention, while health care providers should also be mindful of involving patients' support systems (e.g., family members). Previous research indicated that the use of written information or pictograms/animations may be helpful [65], which should be applicable/personalized to each patient/survivor [16]. Importantly, written information should be offered by the provider as opposed to patients taking notes, because listening and note-taking is a complex task, especially for older individuals [66]. Another easily implementable way to increase recall among patients is to ask them to repeat provided information [67], also known as the teach-back method [68]. To conclude, providers should be mindful of the type of patient/survivor they are consulting and the nature of information they want to share, while systematically checking patients' understanding [63].

## Data statement

As part of consenting to the study, survey respondents were assured that raw data would remain confidential and would not be shared. Descriptive data on group level may be available upon request from the corresponding author.

## CRediT authorship contribution statement

**Vicky Lehmann:** Formal analysis, Visualization, Writing - original draft, Writing - review & editing. **Nanon H.M. Labrie:** Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing - review & editing. **Julia C.M. van Weert:** Conceptualization, Writing - review & editing. **Sandra van Dulmen:** Conceptualization, Funding acquisition, Writing - review & editing. **Hanneke J.C.J.M. de Haes:** . **Marie José Kersten:** Conceptualization, Funding acquisition, Writing - review & editing. **Arwen H. Pieterse:** Conceptualization, Writing - review & editing. **Ellen M.A. Smets:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing - review & editing.

## Declaration of Competing Interest

None.

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