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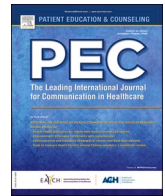
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How does oncologists' communication affect patients' well-being and online health information seeking? – A randomized experiment

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ABSTRACT

Objective: Patients with cancer increasingly rely on online information about their disease. However, the impact of clinicians' responses to patients presenting this information remains unclear. This randomized experiment tested the effects of oncologists' communication approaches on patients' trust, satisfaction, and intentions to seek and discuss online information. Additionally, we explored moderating effects of patients' psychological characteristics.

Methods: In an online vignette experiment, we manipulated clinicians' communication approaches (patient-centered vs. clinician-centered) in hypothetical oncology consultations. (Former) cancer patients (N = 270, 62 ± 13 years, 55 % female) were randomly assigned to one out of eight conditions. We performed 1-way ANOVA's, independent samples t-tests and multiple regressions.

Results: Participants exposed to a patient-centered approach reported higher satisfaction with the consultation ($d = 0.62, p < .001$), stronger trust in the clinician ($d = 0.49, p < .001$), and stronger intentions to seek ($d = 0.40, p < .001$) and discuss online information ($d = 0.69, p < .001$) compared to participants exposed to a clinician-centered approach. Moderation analyses indicated that the effect of communication approach on intention to discuss online information depended on participants' trait anxiety ($b = -0.43, p = .017$) and uncertainty intolerance ($b = -0.35, p = .041$). Uncertainty intolerance further moderated patient satisfaction with the consultation ($b = -0.33, p = .049$). Participants' monitoring coping style moderated the effect of communication approach on online information seeking ($b = 0.23, p = .036$).

Conclusion: Clinicians' patient-centered responses to online information seeking may positively affect patient satisfaction with the consultation, trust in the consultation, and online information seeking behavior. We provide initial evidence that these effects do not apply equally to every patient: levels of trait anxiety, uncertainty intolerance and monitoring coping style influence the relationship between the applied communication approach and patient outcomes.

Practice implications: Clinicians are advised to emphasize collaborative information exchange and guide patients to trustworthy online sources.

1. Introduction

Patients with cancer increasingly turn to online sources for information about their disease, rather than solely relying on information provided by their clinician [1–4]. These sources encompass a wide range of internet-based health information, including websites of healthcare

organizations and non-profits, medically curated or peer-reviewed content, patient forums, and social media platforms. To date, research on the impact of online health information on patients with cancer remains inconclusive. Some researchers report various positive effects of online information, as it may help patients understand and manage their disease [5], prepare for medical consultations [6], and enable patients to

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take an active role in their disease trajectory [7]. However, online information may also increase confusion [8,9], anxiety [6], and uncertainty [7] due to the overwhelming amount of online sources [10], distressing search results [7] or misinformation [11–13].

These mixed findings highlight the necessity to understand the complex effects of online information on patients, as various factors are expected to determine the direction of those effects. Clinician communication being one of those factors, adequate patient-provider communication may help to reduce potential detrimental effects of online information [14,15]. Earlier work, for example, recommended that clinicians should enable patients to discuss online information, as such discussions may guide patients to useful, high-quality information, and correct potential misinformation and/or misinterpretation [16]. However, literature shows that some clinicians remain hesitant to address online information with the patient, because they fear their authority may be challenged, or it may lead to more questions and prolonged consultations [6]. Not knowing how to properly address (patients' use of) online information during consultations, clinicians may dismiss or ignore such information [17]. A recent systematic review found that clinicians' perceptions of patients using online information ranged from highly supportive to highly critical. While some clinicians viewed internet-informed patients as more engaged and better prepared, others expressed concern about misinformation, increased consultation length, and perceived challenges to their medical authority. These perceptions appeared to shape clinicians' communication strategies: physicians with relatively positive attitudes tended to engage in a more patient-centered approach, whereas those with negative attitudes appeared to adopt clinician-centered approaches [18]. In the context of online information, patient-centered communication allows a two-way flow of communication in which both patient and clinician opinions regarding online information are discussed [1]. In contrast, *clinician-centered communication* views communication as a one-way flow, i.e. the patient adopts a rather passive role by relying fully on the medical information provided by the clinician rather than on additional online sources [1]. Clinicians are suggested to engage in discussions about online information with patients in a patient-centered way [1,19,20]. Previous research applies mostly exploratory methods to investigate clinicians' communication about online information: mixed-method research including focus groups with cancer patients and health professionals and surveys [21], cross-sectional survey design [19,22], and semi-structured interviews with clinicians [1]. Whilst such studies yield preliminary evidence, rigorous experimental research is lacking to establish causal effects of oncologists' communication approaches regarding online health information on patients' emotional well-being and behavior.

The main aim of the present study was to experimentally test the effects of clinicians' various responses to patients' discussion of online information. While prior studies have identified various physician responses to patients' use of online health information [23–25], we chose the typology by Caiata-Zufferey and Schulz [1] to obtain a more nuanced understanding of the effects of various communication approaches. This typology was chosen because it offers a conceptually clear and patient-centered framework. It differentiates communication approaches that either discourage or actively support patients' online information seeking, providing a meaningful basis for examining their impact on outcomes such as patients' anxiety, trust, satisfaction, and intention to search and discuss online information. Moreover, the communication approaches are well-suited for experimental design, as they are distinct and easily translated into a vignette, unlike the more granular and overlapping categories found in the work of Bylund or Shen [23–25]. The typology consists of four different communication approaches: Resistance, Repairing Co-construction and Enhancement. *Resistance* refers to clinicians avoiding, ignoring or devaluing online information. *Repairing* entails the clinicians' need to demonstrate the limits of online information and correcting it without leaving room for discussion with the patient. *Co-construction* involves clinicians' use of online information as a starting point to understand patient's viewpoints

and disease comprehension, hereby actively co-establishing common ground. *Enhancement* of online information entails clinicians empowering patients in their online search and providing them with reliable online resources [1]. We specifically test how two clinician-centered (resistance and repairing) and two patient-centered (co-construction and enhancement) approaches affect patients' emotional well-being (i.e., state anxiety, satisfaction with the consultation, and trust in the clinician, online information and the treatment plan) and behavior (i.e., intention to search for and discuss online information). We expected the two patient-centered communication approaches to yield more positive effects (i.e., lower levels of anxiety, higher levels of satisfaction and trust, and stronger intentions to search for and discuss online health information) compared to the two clinician-centered communication approaches.

Our secondary aim was to explore moderating effects of three psychological characteristics, i.e., patients' trait anxiety, their uncertainty intolerance, and their monitoring coping style – i.e., people's tendency to proactively seek information when confronted with a health threat [26]. These characteristics were selected as they are known to be important determinants of the well-being [27,28] and information seeking behavior of patients with cancer [29–31]. We expected that these psychological characteristics might also moderate the effects of communication style on key outcomes such as satisfaction, trust, and patients' intention to seek or discuss online health information. Although we had no a priori strong hypotheses about the precise directions of these effects, we could imagine, for example, that patients with a high monitoring coping style may benefit more from a patient-centered communication style (i.e., clinician validation and/or guidance towards reliable sources) compared to low monitors.

2. Methods

2.1. Study design

We conducted an online experiment using vignettes, i.e. simulated medical consultations, hereby following the GROVE guidelines [32]. In a between-subjects design, the clinician's communication approach regarding the discussion of online information was systematically manipulated, based on previous research, using the following four communication approaches: Resistance, Repairing, Co-Construction and Enhancement [1]. The content was presented either through video or text, resulting in eight conditions, whilst the content stayed identical in written and video format. Specific results regarding the comparison between vignette modality (video vs. written) are described elsewhere, and showed no differences on any of the measured outcomes between the video and written variants (Smets et al., *submitted*). The study was approved by the medical ethics committee of Amsterdam University Medical Centers (approval number 2023.0311).

2.2. Sample and procedure

Participants were recruited via: (1) 'PanelCom' (www.panelcom.nl), a Dutch panel of (former) patients with cancer willing to participate in medical communication research, and (2) 'PanelClix', a representative Dutch panel. Inclusion criteria were as follows: age ≥ 18 , Dutch language proficiency, access to the internet, and a (previous) cancer diagnosis. Interested participants received a link to the online questionnaire. After providing online informed consent, participants completed an initial survey (T0) which assessed background and psychological patient characteristics. Subsequently, participants were randomly assigned to one of the eight vignette conditions. Participants acted as analogue patients (APs), i.e. they were instructed to imagine themselves in the position of the patient portrayed in the vignette. This method offers valid results whilst keeping the burden for patients as low as possible [8]. Immediately after viewing or reading the vignette, APs' emotional well-being (i.e., state anxiety, satisfaction with the consultation, and

trust in the clinician, online information and the treatment plan) and behavior (i.e., intention to search for and discuss online information) were assessed in a second questionnaire (T1). APs were compensated with a €10 voucher or online credits.

2.3. Power

Based on a-priori G*Power analyses ($f = 0.25$, small-medium effect size; ANOVA; power 80 %, $\alpha = .05$; $df = 3$), 179 APs were required to find main effects using ANOVAs for eight experimental conditions and 65 additional APs were required to test interaction effects through regression analysis ($f = 0.25$, small-medium effect size; regression analysis; power 80 %; $\alpha = .05$; 7 predictors). Therefore, we aimed for a minimum of 244 APs.

2.4. Vignette development

A basic script was developed based on a script for a previous vignette study [33] depicting a consultation with a clinician, a patient and her daughter (see Appendix A for script development). The portrayed patient has been previously diagnosed with diffuse large B-cell lymphoma. The clinician discusses treatment procedures and possible side effects. Four script variations were created by manipulating the clinician's response, while keeping parts where the patient brought up their search for online information identical (see Appendix B for an overview of communication approaches and example manipulations). As part of the clinician-centered communication approach, the Resistance condition shows the clinician as generally resistant to online information. In the Repairing condition, the clinician acknowledges the patients' online seeking behavior but warns the patient about online health information being inherently unreliable. As part of the patient-centered communication approach, both the Co-construction and the Enhancement condition involve a two-way flow of communication (patient-centered communication approaches). In the Co-construction condition, the clinician uses online health information to foster a shared understanding and discussion. In the Enhancement condition, the clinician actively encourages the patient to search for information online and recommends reliable sources. The main source of reliable online information referred to in the vignettes is 'Kanker.nl', which is The Netherlands' most comprehensive oncological platform providing evidence-based information, support and exchange of experiences. Throughout the script, the text was manipulated in twelve different instances (see Appendix C for the whole vignette script). Video length was 7:12 min/sec for the Resistance condition, 7:29 for Repair, 7:22 for Co-construction and 7:54 for Enhancement.

To enhance validity, various experts—including communication researchers, clinicians, patients, and laypeople—provided feedback in two iterations and participated in two rounds of pilot-testing at different stages of the vignette development. Experts' input was focused on engagement, realism, and manipulation success. Based on the script and the finalized videos, written vignettes were created. The vignettes were written as a story, each about 1.5 pages long. The written script included descriptions of the non-verbal communication shown in the videos.

2.5. Measures

2.5.1. Background characteristics

Participants self-reported their socio-demographic characteristics at T0, i.e. age, gender, and educational level. In addition, we assessed medical characteristics, i.e. history of cancer, and date of cancer diagnosis. Four relevant sub-scales out of the seven sub-scales of the e-health literacy scale were included as control variables [34]: Information searching, Evaluating reliability of information, Determine relevance of information, and Navigation skills.

2.5.2. Primary outcome variables

State anxiety was measured using the 6-item Dutch version of the short-form State-Trait Anxiety Inventory on a 4-point Likert scale [35]. Patient satisfaction with the consultation was measured using the 5-item Patient Satisfaction Questionnaire (PSQ) on a 5-point Likert scale [36]. Item phrasing was adapted to refer to the portrayed clinician. Trust in clinician was measured using the 5-item validated Trust in Oncologist scale short form (TiOS-sf;), with responses measured on a 5-point Likert scale [37]. Item phrasing was adapted to refer to the specific vignette case. Trust in proposed treatment plan was measured using 1 question (i.e., 'How certain are you that the proposed treatment will work?'), reported on a 5-point Likert scale. Intention to search information online after the consultation was measured using 3 items (e.g., 'I plan to search online information about cancer') on a 5-point Likert scale. Intention to discuss online information in a subsequent consultation was measured using one statement ('I intend to discuss the information about cancer that I have found online in an upcoming consult with my clinician') on a scale from 1 to 5.

2.5.3. Moderating variables

We measured Trait anxiety (T0) using the Dutch version of the 6-item short-form State-Trait Anxiety Inventory (STAI; response scale 1–4 [35]. Uncertainty intolerance (T0) was measured using the 12-item short version of the Uncertainty of Intolerance scale (IUS; using a 5-point Likert scale) [38]. Monitoring coping style (T0) was measured using 3 items adapted from the shortened Threatening Medical Situation Inventory [39] (response scale: 1–5. Item phrasing was adapted to fit the time around the participant's diagnosis.

2.5.4. Vignette design validity

We measured Engagement with the vignette (T1) using the 9-item short version of the Video Engagement Scale (VES; response range: 1–5) [40]. Item phrasing was adapted depending on the vignette mode (video or written). The first item, 'While watching/reading, I was completely focused on the conversation', was used as a filter question: APs scoring ≤ 2 were removed from further analyses ($n = 14$). Perceived realism of the vignette (T1) was assessed using 3 items which were previously developed for other vignette research (response scale: 1–5) [41].

2.5.5. Manipulation check

Manipulation check (T1) questions were 8 self-created items (2 items per communication approach condition), Each AP rated all 8 items on a scale from 1 to 5. Items stated, for instance: 'The clinician discourages searching for information online' (Resistance), 'The clinician corrects the online information brought by the patient' (Repairing), 'The clinician responds positively to the online search behavior of the patient' (Co-Construction) and 'The clinician gives the patient tips to search online information' (Enhancement). Per condition, the two items were tested on Pearson's r correlation to create subscales indicating the APs' level of agreement with the statements (Resistance, $r = .82$, $p < .001$; Repairing, $r = .72$, $p < .001$; Co-construction, $r = .83$, $p < .001$; Enhancement, $r = .79$, $p < .001$).

2.5.6. Quality check

To ensure data quality, we measured the time APs needed to complete the experiment. APs who completed the full questionnaire in under 11 min (written vignette) or 17 min (video), were examined more closely – because it was established that considering the minimal reading time (2 min) or viewing time (8 min), completing all questionnaire items in under 9 min which would be unrealistic. If upon closer inspection the quality of their answers was lacking (i.e., answering all the scales in the same manner; all the manipulation check scales in the same manner; entering a diagnosis date in the future, etc.), these APs were removed from further analysis.

2.6. Data analysis

We first examined the randomization of socio-demographic, control and moderating variables across the four conditions. We tested assumptions for ANOVA, t-tests and regression analyses, and manipulation success using ANOVA. In case of significant group differences, we conducted Bonferroni or Games-Howell post-hoc analyses. Main effects of communication approach on patient outcomes were tested with 1-way ANOVAs (4 communication approaches as independent variable) and one-sided independent samples t-tests (two overarching communication approaches as independent variable). To examine moderation effects, we conducted 18 separate multiple regression analyses with overarching communication approach, each of the three moderators and newly created interaction variables respectively as independent variables, and each of the six patient outcomes as dependent variables.

3. Results

3.1. Sample characteristics

A total of 480 APs started the questionnaire, with n = 456 (95 % signing the informed consent. An additional 186 APs were excluded who did not finish the questionnaire (n = 101), did not meet the inclusion criteria (n = 62), completed the questionnaire twice (n = 2), did not pass the quality check (n = 7), and/or scored ≤ 2 on engagement (n = 14). Thus, 270 APs were included in the final analyses (see Appendix D for exclusion process). Table 1 shows sample characteristics and Appendix E specifies the number of APs per experimental group.

3.2. Randomization and manipulation check

Randomization was successful for all variables. The manipulation check indicated consistent significant differences in scores between the clinician-centered conditions (Resistance and Repairing) and the

Table 1
Sample characteristics (N = 270).

Analogue patient characteristics	N(%) / M (SD)	Cronbach α
Gender (female), n (%)	148 (55 %)	
Age (years), M (SD)	61.64 (13.33)	
Education, n (%)		
Low	46 (17 %)	
Medium	103 (38 %)	
High	121 (45 %)	
Medical background, n (%)		
Currently have cancer	67 (25 %)	
Have had cancer in the past	203 (75 %)	
Date diagnosis, M (SD)	8.04 (7.30)	
E-health literacy, M (SD)	2.96 (0.49)	
Trait anxiety, M (SD)	1.72 (0.64)	α = .91
Uncertainty intolerance, M (SD)	2.71 (0.71)	α = .90
Monitoring coping style, M (SD)	3.61 (1.00)	α = .82
State anxiety, M (SD)	2.78 (0.61)	α = .84
Satisfaction with the consultation, M (SD)	3.83 (1.01)	α = .91
Trust in clinician, M (SD)	3.81 (0.78)	α = .89
Trust in treatment plan, M (SD)	3.18 (0.80)	n.a.
Intention to search information online, M (SD)	3.66 (1.02)	α = .91
Intention to discuss online information with clinician, M (SD)	3.69 (0.98)	n.a.
Engagement, M (SD)		α = .88
Full scale	3.52 (0.71)	
Immersion subscale	3.32 (0.87)	
Emotional subscale	3.55 (0.77)	
Realism, M (SD)	4.00 (0.68)	α = .86

Note: Higher scores indicate higher E-health literacy, trait anxiety, uncertainty intolerance, monitoring coping style, state anxiety, satisfaction, trust in clinician and treatment plan, intention to search for and discuss online information, engagement and realism.

patient-centered conditions (Co-construction and Enhancement). However, no significant differences (p-values ranging between .196 and 1.000) were found among the clinician-centered and patient-centered conditions. See Appendix F for full manipulation check results. Therefore, we combined the four communication approaches into two overarching approaches, i.e. a clinician-centered approach (Resistance and Repairing) and a patient-centered approach (Co-construction and Enhancement). In further analyses, we used these two overarching communication approaches as independent variables. As a check, the analyses were repeated for the four communication approaches separately – these results are reported in Appendix G and indicated similar, weaker effects as for the two overarching communication approaches.

3.3. Main effects

APs in the patient-centered condition were significantly more satisfied with the clinician ($t(263.64) = 5.12, p < .001, d = 0.62$), reported significantly higher trust in the clinician, ($t(268) = 4.00, p < .001, d = 0.49$), reported a significantly stronger intention to search information online after the consultation ($t(267.52) = 3.31, p < .001, d = 0.40$), and reported a stronger intention to discuss online information in a further consultation ($t(244.81) = 5.51, p < .001, d = 0.69$) compared to APs in the clinician-centered condition, which was in line with our expectations. APs in the patient-centered approach did not report higher trust in the proposed treatment plan ($t(267.61) = -0.16, p = .724$) or less anxiety ($t(266.50) = 1.02, p = .928$) as compared to APs in the clinician-centered condition. Table 2 provides an overview of the main effects.

3.4. Moderating effects

3.4.1. Trait anxiety

Moderation analysis for trait anxiety was conducted with six respective regression models (one model per dependent variable) and resulted in one significant interaction effect for trait anxiety and communication approach on APs' intention to discuss online health information, $b = -0.43, t = -2.41, p = .017$ (see Appendix H.1 for all regression coefficients per interaction). Among low-anxiety APs, a patient-centered approach resulted in a stronger intention to discuss online health information compared to the clinician-centered approach (see Fig. 1). However, with increasing trait anxiety, this effect subsided: for highly anxious APs, communication approach seems less influential for the intention to discuss online health information with the clinician. No other significant moderation effects were found for trait anxiety.

3.4.2. Uncertainty intolerance

For uncertainty intolerance as a moderator, regression models showed a significant interaction effect between communication approach and patients' uncertainty intolerance on patient satisfaction

Table 2
Overview of main effects of communication approach on patient outcomes.

Dependent variable	Clinician-centered; M (SD)	Patient-centered; M (SD)	Mean difference, 95 %CI [LL, UL]
Trust in clinician	3.63 (0.77)	4.00 (0.75)	0.37, [0.19, 0.55]**
Satisfaction with the consultation	3.55 (1.06)	4.15 (0.85)	0.60, [0.37, 0.84]**
Intention to search online information	3.46 (1.06)	3.87 (0.93)	0.40, [0.16, 0.65]**
Intention to discuss online information with clinician	3.38 (1.03)	4.02 (0.81)	0.63, [0.41, 0.86]**
State anxiety	2.81 (0.62)	2.74 (0.61)	0.08, [-0.07, 0.22]
Trust in proposed treatment	3.17 (0.82)	3.19 (0.78)	0.02, [-0.21, 0.18]

** Significant difference at $p < .001$

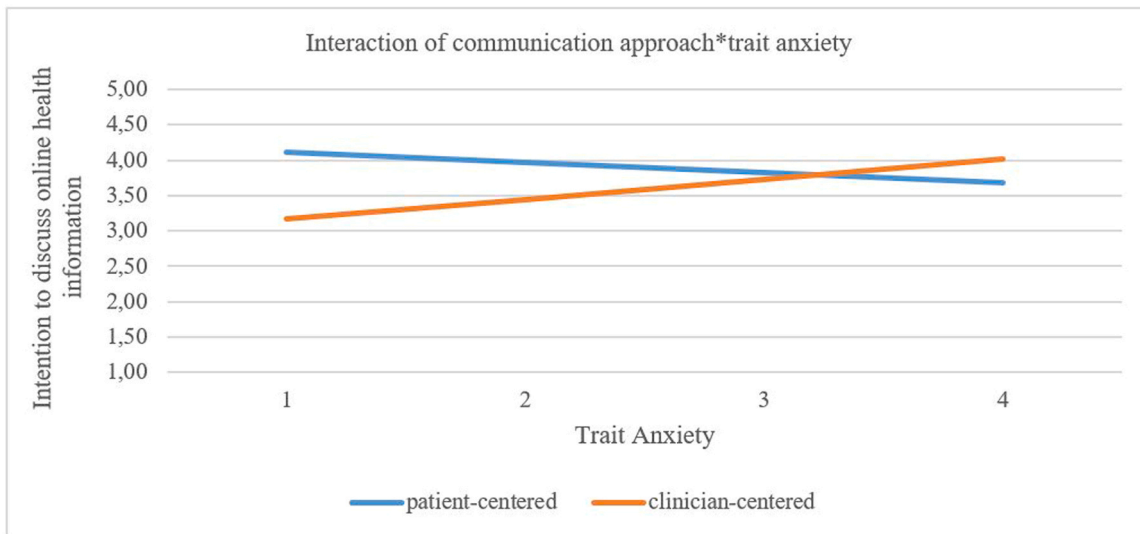


Fig. 1. Interaction effect between communication approach and trait anxiety on intention to discuss online health information with clinician.

with the consultation, $b = -0.33, t = -1.98, p = .049$. The effect was stronger for APs with low uncertainty intolerance: the patient-centered approach led to higher satisfaction compared to the clinician-centered approach (see Fig. 2, left graph). It is worth noting that residuals were slightly skewed and neither linearity nor homoscedasticity were optimal. Therefore, results should be interpreted with caution. Further, uncertainty intolerance moderated the relationship between communication approach and intention to discuss online health information with the clinician, $b = -0.35, t = -2.06, p = .041$. The effect of communication approach on intention to discuss online health information was stronger for APs with low uncertainty intolerance, with a patient-centered approach leading to a higher intention to discuss online health information compared to the clinician-centered approach (see Fig. 2, right graph). Similarly to trait anxiety, the effect subsided with higher intolerance. No further moderation effects were found for uncertainty intolerance.

3.4.3. Monitoring coping style

Lastly, for monitoring coping style we found one significant moderation effect. Regression analyses yielded a significant interaction between communication approach and patients' monitoring coping style on online health information seeking, $b = 0.23, t = 2.11, p = .036$.

For low-monitoring APs, clinicians' communication approach was less influential as compared to APs scoring higher on monitoring. Results indicate that high monitors showed a higher intention to search for online health information after being exposed to a patient-centered approach compared to a clinician-centered approach (see Fig. 3). No further moderation effects were found for monitoring coping style. Appendix H shows results of all moderation effects.

4. Discussion and conclusion

4.1. Discussion

The present study explored the effects of oncologists' communication approaches on patients' emotional well-being and their intentions to seek and discuss online health information. Our results revealed that a patient-centered communication approach towards online health information fosters greater patient satisfaction with the consultation, trust in clinician, and intentions to search for and discuss online information with their clinician compared to a clinician-centered approach. These findings corroborate the benefits of patient-centered communication when discussing online health information in medical consultations.

The results substantially support earlier research that emphasizes the

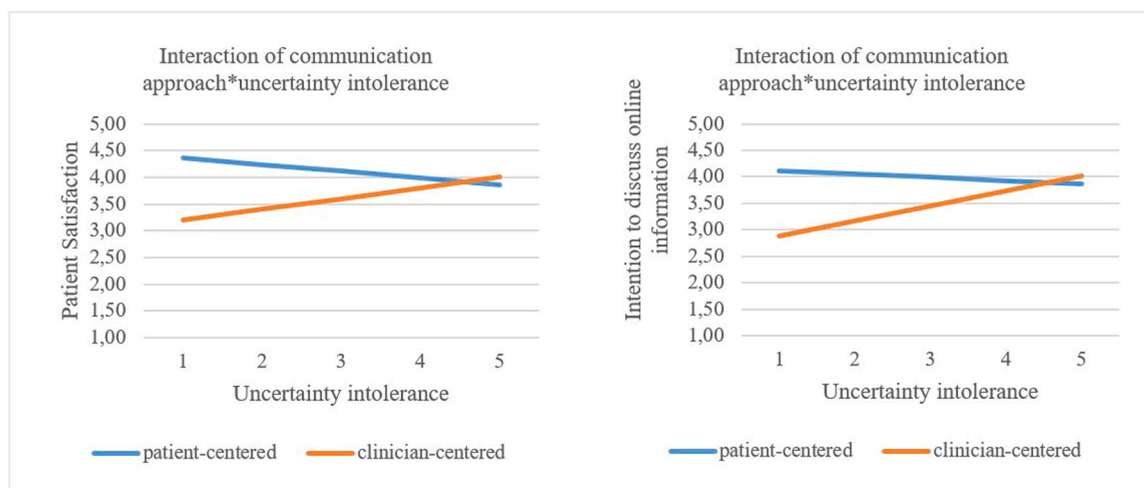


Fig. 2. Interaction effects between communication approach and uncertainty intolerance on patient satisfaction with the consultation (left), and on intention to discuss online health information with clinician (right).

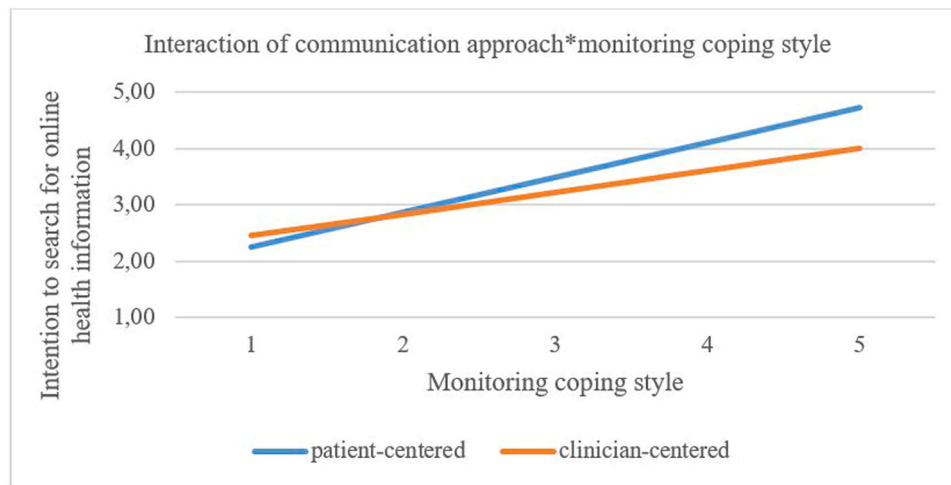


Fig. 3. Interaction effect between communication approach and monitoring coping style on intention to search for online health information.

importance of patient-centered communication when discussing online health information. When clinicians discuss online health information seeking with patients, e.g., by asking if and what they have searched for online and actively listening to patients' concerns, patients reported greater satisfaction and trust. This aligns with earlier work showing that patients exposed to a clinician who validated or agreed with online health information led to higher levels of satisfaction and trust [17,22].

Conversely, when clinicians dismiss, ignore or devalue patients' online health information seeking behavior, patients not only experience lower satisfaction and trust, but also a lower intention to discuss online health information in future consultations, which aligns with earlier work about patients' willingness to disclose online health information seeking depending on the clinician's communication approach [17]. This may significantly harm the patient-provider relationship, and may not prevent patients from returning to online sources in the future [22]. Contrary to previously reported beliefs among some clinicians that online health information may damage the patient-provider relationship [5,18,23,42], our findings indicate that a patient-centered communication approach may have beneficial effects. Particularly in the context of serious illnesses such as cancer, fostering a trusting patient-provider relationship is essential for effective communication and the provision of information. This will ensure high-quality care throughout extended treatment trajectories. Adapting previous communication strategies [43], clinicians may use a patient-centered communication approach towards online health information. This approach could help mitigate the potential risks associated with prevalent misinformation found online [11,12] and the potential use of AI-based models such as ChatGPT for health-related information [44]. In guiding patients towards reliable information, it is crucial clinicians have up-to-date knowledge about reliable and less reliable sources. An example of such information source in the Netherlands is 'Kanker.nl' – the site referred to in our vignette. Kanker.nl is a comprehensive and actively monitored platform providing reliable information, support and exchange of experiences. It was developed in collaboration between Dutch cancer patient organizations, comprehensive cancer centers and the Dutch Cancer Society. However, as patients increasingly turn to new websites, forums, and social media platforms for health information, it is essential that clinicians stay informed about which sources are most commonly used, emerging, or potentially misleading [45].

Contrary to our expectations, communication approach did not significantly affect patients' anxiety and trust in the proposed treatment. Non-significant findings may be due to the methodological choice of using APs as study participants for the present study. Results indicated medium scores of anxiety. Hence, having APs watch or read a scripted consultation online may not reflect patients' levels of anxiety as it would

when experiencing the situation. Similarly, since the proposed treatment may not relate to APs actual treatment, APs may have been less involved in the treatment plan, therefore being indifferent to the proposed treatment in the script. Nevertheless, APs may still enable a better representation compared to the general population as they have experienced a comparable situation.

Interestingly, psychological characteristics as trait anxiety, uncertainty intolerance, and monitoring coping style moderated the effects of communication approach on patient outcomes. Less anxious patients benefitted more from patient-centered communication than from clinician-centered communication, as it significantly increased their intention to discuss online information with their clinician. However, this effect diminished as trait anxiety increased. For highly anxious patients, communication approach seemed less impactful, suggesting that these patients may require additional emotional support to mitigate their anxiety. As higher levels of trait anxiety are associated with more online health information seeking [46] and online information in turn may result in more confusion, discussing online health information may be needed in highly anxious patients irrespective of the communication approach. Moreover, more anxious patients may have a more pronounced tolerance for relatively directive clinicians than less anxious patients, which may explain the diminishing effects of communication approach for these patients. Further research should explore the particular needs of highly anxious patients regarding online health information and the communication thereof.

Similarly, uncertainty intolerance predicted patient satisfaction with the consultation and intention to discuss online information. Patients with low uncertainty intolerance (i.e., who had a higher tolerance for uncertainty) found greater satisfaction in patient-centered approaches, which allowed for collaborative discussion of online health information. As uncertainty intolerance increased, however, the benefits of a patient-centered approach diminished. Patients with higher uncertainty intolerance may feel overwhelmed by the abundance of information, even in a collaborative setting, and may prefer a more directive approach from the clinician to manage their uncertainty. Our findings regarding the impact of both trait anxiety and uncertainty intolerance align with the notion that 'patient-centered communication' may translate into various communication practices, depending on characteristics of the context and/or patient [47]. For example, while stimulating autonomy may work best for some patients and in some situations, others may call for a more directive approach. Further research is needed to investigate these assumptions.

Finally, patients with a high monitoring coping style, i.e. those who actively seek information to cope with their illness, showed a stronger intention to search for online health information when clinicians

adopted a patient-centered approach than when they adopted a clinician-centered approach. Previous literature suggests that monitoring coping style is more personality trait-based than situation-based (e.g., dependent on type of tumor or treatment), and therefore will not change throughout the disease trajectory [48]. A tailored, patient-centered communication approach offers room for discussion, voicing (treatment) preferences and guiding patients towards reliable online information sources – an approach that may be particularly favorable for high-monitors.

Current findings should be interpreted in light of some limitations. While we have taken additional measures such as following existing methodological recommendations [49], involving clinicians in the vignette development, measuring engagement and realism, and conducting manipulation checks to increase internal validity [8], using APs may not fully capture the complexities of real-life patient-clinician interactions. However, having controlled for vignette engagement, our mean scores show on average high engagement scores, which indicates ecological validity. Future research could benefit from field studies involving recordings of consultations of real patients and clinicians to validate these findings in naturalistic settings. Second, our manipulation of clinician communication approaches caused the video variants to differ in length. Specifically, videos in the patient-centered conditions were somewhat longer in duration (mean 7:38 min/sec) compared to the clinician-centered conditions (mean 7:21 min/sec). The longer length of the patient-centered conditions reflects their core features such as acknowledging, encouraging, and guiding online information seeking, which inherently requires more explanation and support from the oncologist. It is therefore possible that the *amount* of communication by the oncologist explains some of the established effects, rather than the *approach* and *content* of communication. In balancing experimental control with realism, we preferred these slight differences in duration over creating videos of identical length. The latter approach might have involved adding meaningless segments of communication to the shorter duration videos to ‘fill up’ the time, which would have threatened realism and ecological validity.

Third, differences between the two respective clinician-centered conditions (i.e., resistance and repairing) and the two patient-centered conditions (i.e., co-construction and enhancement) were too marginal, which is why we eventually did not make a distinction between four conditions but contrasted the two overarching communication approaches. Recommendations about nuances in communication approaches can therefore not be made. However, our study significantly enhances existing research by establishing causality between communication approaches and patient well-being and online information seeking behavior. This enables us to provide applicable, evidence-based recommendations to practicing clinicians on how to effectively communicate about online health information.

Fourth, a key limitation of our research is that it does not differentiate between types of online health information sources. This aligns with previous research which found that clinicians' reactions to patients' use of online information are not necessarily tied to the *type* of online source (e.g., website vs. social media), but rather to factors such as the quality of the patient-clinician relationship, the patient's health literacy, and the clinician's comfort with digital health tools [18]. This suggests that depending on the interactional context, clinicians may perceive online information as either a threat or an opportunity, regardless of its source. Future research should examine how different types of online health information (e.g., institutional websites, patient fora, or social media posts) interact with various clinician communication approaches (e.g., resistance, repairing, co-construction, enhancement) and contextual factors such as digital health literacy. Such research could clarify how specific combinations of source type and communication style influence patient outcomes and communication quality.

5. Conclusion

Our results reveal that a patient-centered communication approach can increase patient satisfaction with the consultation, trust in clinician and the intention to search for, and discuss online health information. The results provide initial evidence that these effects do not apply equally to every patient: levels of trait anxiety, uncertainty intolerance and monitoring coping style influence the relationship between the applied communication approach and patient outcomes.

5.1. Practice implications

Present findings suggest that clinicians should embrace a collaborative and supportive approach when discussing online health information, as it positively influences patient outcomes. Clinicians may use patients' online findings as an opportunity for dialogue rather than seeing them as a challenge to their expertise. For example, when a patient mentions information found online, clinicians can *validate and actively explore* ('Good that you already searched information online. Can you tell me what you have read?'), *guide towards reliable sources* ('When you search for information at a later stage, sites X and Y provide trustworthy information, while information provided in personal blogs and fora may be less reliable.'), and *encourage further discussion* ('if you have any questions about what you have encountered online, we can always discuss these during a later appointment'). Tailoring communication to the patient's psychological characteristics further enhances the effectiveness of these strategies, offering a promising way for improving patient care in oncology settings. This knowledge may be used as guidance for clinicians (in training) to improve patient-provider communication regarding online health information in oncological consultations.

Author contributions

EMAS acquired funding for the research project. EMAS, JCMVW, MAH, AJL and CZ conceptualized the study. CZ further developed vignette materials, in regular consultations with EMAS, JCMVW, MAH and AJL as supervising Principal Investigators. CZ collected data and interpreted findings, thereby also contributed to the original draft of methods and results. Data was accessed and verified by CZ and TH. TH was responsible for writing, reviewing and editing based on regular feedback given by all authors. CZ and TH contributed equally to this study. Through several rounds of revision, consensus was reached upon the final manuscript by all authors.

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van Weert Julia CM: Writing – review & editing, Supervision, Conceptualization. **Linn Annemiek J:** Writing – review & editing, Validation, Supervision, Conceptualization. **Chamoetal Zeidler:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Methodology, Formal analysis, Conceptualization. **Tanja Henkel:** Writing – review & editing, Writing – original draft, Visualization, Validation, Formal analysis. **Hillen Marij A:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization. **Smets Ellen MA:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Ellen Smets reports financial support was provided by Dutch Cancer Society. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A–H. Supporting information

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Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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