How to present online information to older cancer patients

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Chapter 3

Illustrations enhance older colorectal cancer patients' website satisfaction and recall of online cancer Information

This chapter is published as: Bol, N., Smets, E. M. A., Eddes, E. H., De Haes, H. C. J. M., Loos, E. F., & Van Weert, J. C. M. (2015). Illustrations enhance older colorectal cancer patients' website satisfaction and recall of online cancer information. *European Journal of Cancer Care, 24*(2), 213-223. doi: 10.1111/ecc.12283

Abstract

This study aims to investigate the effects of illustrations in online cancer information on older cancer patients' website satisfaction (i.e., satisfaction with the attractiveness, comprehensibility and emotional support from the website) and recall of information. In an online experiment, 174 younger (< 65 years) and older (≥ 65 years) colorectal cancer patients were randomly exposed to a webpage about transanal endoscopic microsurgery consisting of either text-only information, text with two cognitive illustrations or text with two affective illustrations. In general, adding cognitive illustrations compared to text-only information improved the satisfaction with the attractiveness of the website in both younger and older patients. For older patients in particular, cognitive illustrations facilitated recall of cancer information: whereas older patients recalled less information overall compared to younger patients (39% vs. 50%), no statistically significant differences in age on recall were observed when cognitive illustrations were added to text. Furthermore, older patients were more satisfied with the emotional support from the website than younger patients, especially when affective illustrations were present. Our results suggest that effective online cancer communication for ageing populations involves considering both cognitive and affective illustrations to enhance website satisfaction and recall of cancer information.

Introduction

As the Internet is becoming an increasingly valuable source of cancer information, it is important to acknowledge the consequences for aging populations. Older adults are the fastest growing group online (Hart, Chaparro, & Halcomb, 2008; US Census Bureau, 2010). Recent figures in the Netherlands show that 80% of people aged between 65 and 75, and 39% of people aged 75 and older, currently use the Internet (Statistics Netherlands, 2013b). Similar figures exist for other Western countries (Cresci, Jarosz, & Templin, 2012). Yet older adults are known for having more problems seeking, finding and understanding online cancer information than their younger counterparts (Xie, 2008). This might result in lower satisfaction with cancer-related websites (Rideout, Neuman, Kitchman, & Brodie, 2005). Website satisfaction is an important motivational factor for processing and learning information (Park & Lim, 2007). Website satisfaction may, therefore, also influence recall of information, that is the ability to reproduce information. Recall of information is crucial for optimal health outcomes, such as adequate medication intake (Linn, Van Dijk, Smit, Jansen, & Van Weert, 2013), reduced anxiety (Stark & House, 2000) and active participation in decision making (Gaston & Mitchell, 2005). However, more than half of online medical information is immediately forgotten (Van Weert et al., 2011; Bol, Van Weert, et al., 2014), especially by older adults due to gradual decline in cognitive resources that are necessary for understanding and processing new medical information (Salthouse & Babcock, 1991; Brown & Park, 2003). It is, therefore, crucial to identify effective ways of presenting online information to older adults to increase website satisfaction and recall of information.

Cognitive and affective illustrations in online cancer information

Illustrations are commonly used in health information materials about cancer (King, 2015), and have been found to enhance website satisfaction (Bol, Van Weert, et al., 2014) and recall of information (Houts, Doak, Doak, & Loscalzo, 2006). The functional approach to the effects of text illustrations distinguishes between two types of illustrations: cognitive and affective illustrations (Levie & Lentz, 1982). Cognitive illustrations, such as icons and graphs that visually represent text, are explanatory by facilitating comprehension and learning of information (King, 2015; Levie & Lentz, 1982). Affective illustrations, such as photos of persons, do not aim to explain text information but rather aim to enhance enjoyment and elicit positive emotions (Levie & Lentz, 1982).

Earlier research gives reason to assume that cognitive and affective illustrations can influence three types of website satisfaction. First, studies have shown that both cognitive and affective illustrations increase *satisfaction with the attractiveness of a website* (Van Weert et al., 2011; Bol, Van Weert, et al., 2014). This type of satisfaction refers to the extent to which web users find the website nicely looking and enjoyable. Second, research has also shown that cognitive illustrations are especially effective in improving *satisfaction with the comprehensibility of a website* (Van Weert et al., 2011). This can be defined as the extent to which users are content with the readability level and clarity of the information on the website. Third, affective illustrations contribute to higher *satisfaction with the emotional support from a website* (Harp & Mayer, 1997).

Online information is found to provide its users with emotional benefits by enhancing feelings of, for instance, hope and empowerment (Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002; Høybye, Johansen, & Tjørnhøj-Thomsen, 2005), and can therefore be referred to as the extent to which users feel that a website helps deal with emotions and stress.

Furthermore, the cognitive theory of multimedia learning suggests that individuals learn better from words and pictures than from words alone (Mayer, 2014). As cognitive illustrations facilitate building mental images by creating connections between words and pictures, these illustrations are expected to reduce working memory demands, which in turn increases recall of information (Paivio, 1990). Cognitive illustrations might especially benefit
older people, as their working memory capacity gradually declines as they age (Salthouse & Babcock, 1991). Moreover, affective illustrations can also aid older adults in recalling information. The socioemotional selectivity theory argues that emotionally relevant information is better remembered by older adults, since emotional goals are prioritized when life is perceived as more limited (Carstensen, Fung, & Charles, 2003). Affective illustrations could generate positive feelings, which may transfer to the online text as well, resulting in better recall of information.

While a number of studies have examined the effects of illustrations on website satisfaction (e.g., Park & Lim, 2007) and recall of information (e.g., Mayer, 2014), research on how older cancer patients could benefit from cognitive and affective illustrations has been scarce, and findings have been inconsistent. For instance, while some research has reported that cognitive illustrations improve website satisfaction in older healthy adults (Van Weert et al., 2011), other research did not find evidence for enhanced website satisfaction in older healthy adults when cognitive or affective illustrations were present (Bol, Van Weert, et al., 2014). Likewise, with respect to recall of information, some research has claimed that older adults recall information better when cognitive illustrations are added to text (Cherry, Dokey, Reese, & Brigman, 2003) or when affective illustrations are present (Carstensen et al., 2003), while other research has failed to find such evidence (Liu, Kemper, & McDowd, 2009).

There are several possible explanations for these inconsistent findings. First, definitions of young and old age differ across studies. Second, research among patient populations is limited. Considering that previous age definitions might not be representative for the average age of younger and older cancer patients, this study specifically aims to investigate the effects of cognitive and affective illustrations on website satisfaction and recall of online cancer information among colorectal cancer patients. We thereby particularly focus on how older cancer patients benefit from such illustrations. However, to test whether adding illustrations would not disadvantage younger cancer patients, we compare the effects of both younger and older cancer patients. In assessing age differences, we chose age younger than 65 for the younger age group and age 65 and older as the older age group. These two age groups are generally considered suitable for separate analysis in oncology settings (Jorgensen, Young, Harrison, & Solomon, 2012). The central research question to this study is: What are the effects of adding cognitive and affective illustrations to online information on younger and older colorectal cancer patients' website satisfaction and recall of information?

Method

Colorectal cancer patients were randomly assigned to one of three experimental conditions (webpage with text-only information vs. webpage with text and cognitive illustrations vs. webpage with text and affective illustrations) stratified by age (younger [$<$ 65 years old] vs. older [$\geq$ 65 years old]). Power calculation was based on a between-subjects design using an analysis of variance (ANOVA) to analyze differences between the experimental conditions and age groups. To acquire statistical power of 80% to detect medium effect sizes ($f = 0.25$) with an alpha of 0.05, a total sample size of at least 158 patients was needed (Cohen, 1988).

Stimulus materials

We used the Deventer Hospital website to develop a webpage containing information about transanal endoscopic microsurgery (TEM), a minimally invasive solution for the excision of certain rectal polyps or early-stage rectal tumors. It was important that our participants had no prior knowledge about TEM to ensure that information recall was a result of exposure to the webpage presented during this experiment. Since TEM is a relatively uncommon treatment in the colorectal cancer patients of our study sample, we expected our participants to have little prior knowledge. We created three versions of this webpage: text-only information, text with cognitive illustrations and text with affective illustrations. The text information about TEM was the same across conditions.

Based on two pretests (see Appendix A for more detailed description), two cognitive and two affective illustrations were selected. First, eight cognitive and eight affective illustrations were pretested among colorectal cancer patients ($n = 48$). The cognitive illustrations contained four illustrations depicting TEM treatment using a special tube to excise rectal polyps or early-stage rectal tumors, and four illustrations depicting a stoma, which is an artificial opening of an internal organ on the surface of the body created surgically as a result of a complication that can occur during TEM treatment. The eight affective illustrations were colored photos depicting health professionals with or without patients.

Based on three cognitive items, we selected two cognitive illustrations depicting (1) the TEM treatment and (2) a stoma. Three affective items revealed the most favorable affective illustration, which was selected as the upper illustration on the affective illustrations webpage. However, the pretest did not reveal a second particularly well-evaluated affective illustration, resulting in conducting a second pretest among a new sample of colorectal cancer patients ($n = 16$). Based on this second pretest, we selected the webpage with two affective illustrations that showed (1) a male doctor presenting an anatomical model of a colon and (2) a female doctor visiting a male patient who is lying in bed. The illustrations were added on the right side of the webpage (see Figures 3.1 and 3.2).

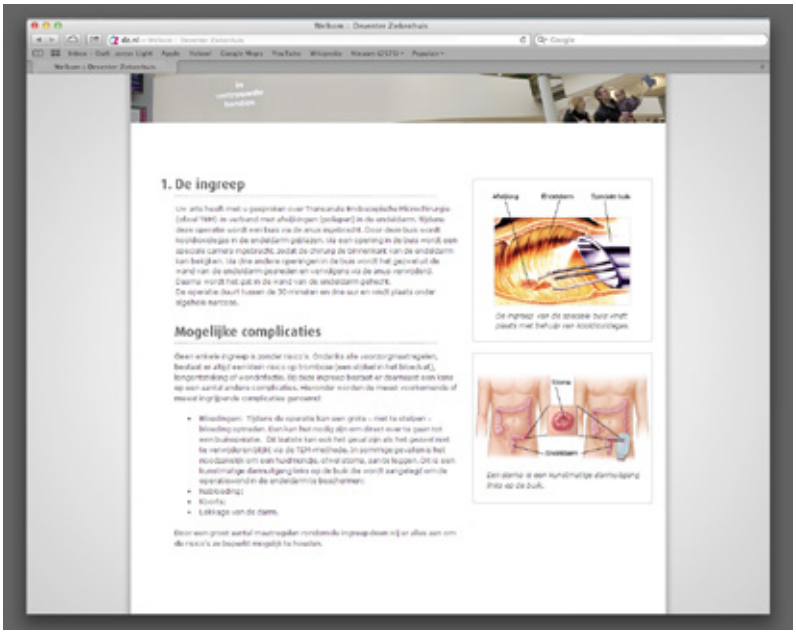

Figure 3.1. Webpage of the Deventer Hospital containing information on transanal endoscopic microsurgery and two cognitive illustrations.

Figure 3.2. Webpage of the Deventer Hospital containing information on transanal endoscopic microsurgery and two affective illustrations.

Sample

Patients with a colon, rectum or rectosigmoid carcinoma who had visited the Deventer Hospital in the Netherlands for a follow-up consultation between March 2011 and May 2014 were identified. Eligibility criteria required patients to (1) be aged 18 years or older, (2) have no cognitive declines according to the medical file, (3) have access to the Internet to complete the online questionnaire and (4) have provided digital informed consent. Only follow-up patients were approached, since we considered it unethical to provide newly diagnosed patients with information about a treatment option (TEM) that would not be among the available treatment options that were being discussed with their oncologists.

Procedure

A physician assistant at the Deventer Hospital selected colorectal cancer patients who met the first two eligibility criteria of the study. Patients were approached by telephone and asked whether they had access to the Internet and were willing to complete an online questionnaire. Patients were then informed about the study, and interested patients received a link to an online questionnaire. Patients could only start the questionnaire after consenting with the proposed study via a statement in the questionnaire. After questions on socio-demographic and medical characteristics, patients were randomly exposed to one of three webpages. Patients were informed to carefully attend to the webpage and that they could not return to the webpage. After exposure, patients' recall of the information on the webpage was assessed. Next, patients were able to view the webpage again, followed by questions on their satisfaction with the webpage. Finally, patients were asked whether they completed the questionnaire themselves, with someone else or whether someone else completed the questionnaire for them. Ethical approval for this study was granted by the local feasibility advisory committee of the Deventer Hospital (reference number ME 13-26) and the institutional review board of the Amsterdam School of Communication Research (reference number 2014-CW-100).

Measures

Website satisfaction

Website satisfaction was measured with the Website Satisfaction Scale (Bol, Van Weert, et al., 2014), which consists of three subscales, that is satisfaction with the attractiveness of the website, satisfaction with the comprehensibility of the website and satisfaction with the emotional support from the website. A selection of items reflecting these scales were, respectively, "the website contains clear language," "the website looks nice" and "the website gives ease of mind." All items were rated on a 7-point Likert scale (1 = "totally disagree," 7 = "totally agree"). A confirmatory factor analysis (CFA), using the three original subscales as put forth by Bol, Van Weert, et al. (2014), resulted in very poor fit. An exploratory factor analysis suggested a better three-factor solution by omitting two items that loaded on two factors (factor loadings > 0.40). After omission, CFA resulted in a good fit with χ^2 (31) = 55.73, p = .004, root mean squared error of approximation (RMSEA) = .068, Standardized Root Mean Square Residual (SRMR) = .062, Tucker-Lewis Index (TLI) = .974, comparative fit index (CFI) = .982 Reliability analysis confirmed three reliable subscales, that is

satisfaction with the attractiveness of the website (three items, α = .86), satisfaction with the comprehensibility of the website (three items, α = .88) and satisfaction with the emotional support from the website (four items, α = .95).

Recall of information

Recall was assessed based on the Netherlands Patient Information Recall Questionnaire (Jansen, Van Weert, et al., 2008). Eleven free-recall questions reflected the TEM information on the webpage, for example "During TEM treatment, a special tube is used. How is this tube inserted?" All questions were provided with a textbox in which patients could answer each specific question. Scores were allocated using an a priori developed codebook, consisting of the following scores: 0 (not recalled), 1 (partially recalled) and (fully recalled). A second coder independently scored 45 (25.9%) of the cases to assess interrater reliability, which appeared to be good (mean κ = 0.94, range = 0.85 – 1.00). Scores for the 11 questions were summed and ranged from 0 to 22. These scores were converted to percentages of correctly recalled information.

Patient characteristics

Patients' socio-demographic background was addressed by items that enquired about age, gender and education. Next, patients' medical background was assessed by items about diagnosis (i.e., type and time since diagnosis in months) and treatment (i.e., type and treatment goal). Additional relevant background characteristics included Internet use (hours per week), prior medical knowledge (i.e., in general, about colorectal cancer, and about TEM, measured on a 7-point Likert scale, range: 1 = "no knowledge," 7 = "much knowledge") and patients' frailty. Frailty was measured using the Groningen Frailty Indicator (Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004), a 15-item scale to screen the loss of functions and resources in physical (mobility functions, multiple health problems, physical fatigue, vision, hearing), cognitive (cognitive functioning), social (emotional isolation) and psychological functioning (depressed mood, feelings of anxiety). Each item was rated with 0 or 1 point, resulting in a sum scale ranging from 0 (not frail at all) to 15 (very frail).

Statistical analysis

F-statistics and chi-square statistics were used to test whether randomization had succeeded for age, gender, educational level, diagnosis, treatment, Internet use, prior medical knowledge and frailty. To establish whether adding illustrations to text enhances website satisfaction and recall of cancer information, four ANOVAs were conducted, with condition and age group as independent variables, and the three satisfaction subscales and recall of cancer information as the dependent variables. Additional Tukey's HSD (honest significant difference) tests (to compare means within the three experimental groups) and simple effects analysis (to compare means of one independent variable within the other) were conducted where appropriate.

Results

Sample randomization and characteristics

The patient recruitment flow is depicted in Figure 3.3. A total of 371 patients were assessed for eligibility, of which 73.3% ($n = 272$) were eligible to participate in the study. Eligible participants were more likely to be younger than non-eligible participants, $F(1, 369) = 33.63$, $p < .001$, $\eta_p^2 = 0.08$, and were more often men, $\chi^2 = 7.03$, $p = .008$. The main reason for not being eligible to participate in the study was not having access to a computer or the Internet (89.9%, $n = 89$). Before randomization, another 20.6% ($n = 56$) dropped out, resulting in randomizing 83 younger and 133 older patients to the experimental conditions. Of those who were randomized to the allocated condition (i.e., text-only information, $n = 70$; text with cognitive illustrations, $n = 73$; text with affective illustrations, $n = 73$), 7.4% ($n = 16$) did not finish the questionnaire for unknown reasons. Of those patients who completed the questionnaire ($n = 200$), 13.0% ($n = 26$) were excluded from analysis, due to having prior TEM knowledge (i.e., scored higher than 4 on a 7-point Likert scale) (42.3%, $n = 11$), reporting to have another diagnosis than colorectal cancer (15.4%, $n = 4$), not understanding the questionnaire (15.4%, $n = 4$), not having completed the questionnaire independently (11.5%, $n = 3$), reporting to have undergone TEM (11.5%, $n = 3$) and filling out the questionnaire twice (3.9%, $n = 1$). The total sample of 174 patients was sufficient to detect meaningful differences according to the power analysis.

The final sample of 174 patients was on average 67.75 years old ($SD = 9.02$, range = 37 – 90) and 61.5% were men. Of these patients, 62 were younger ($M_{age} = 58.03$, $SD = 5.17$, 56.5% men) and 112 were older adults ($M_{age} = 73.13$, $SD = 5.50$, 64.3% men). Besides older patients being significantly older than younger patients, $F(1, 172) = 313.34$, $p < .001$, $\eta_p^2 = 0.65$, older patients were also less likely to receive chemotherapy compared to younger patients, $\chi^2 = 4.84$, $p = .028$, and had less prior colorectal cancer knowledge, $F(1, 172) = 4.28$, $p = .040$, $\eta_p^2 = .02$, and TEM, $F(1, 172) = 4.37$, $p = .038$, $\eta_p^2 = .03$. Nevertheless, the experimental conditions stratified by age group did not differ on any of these variables, which suggested successful randomization. We, therefore, did not include any covariates in our analyses. Patient characteristics stratified by age are shown in Table 3.1.

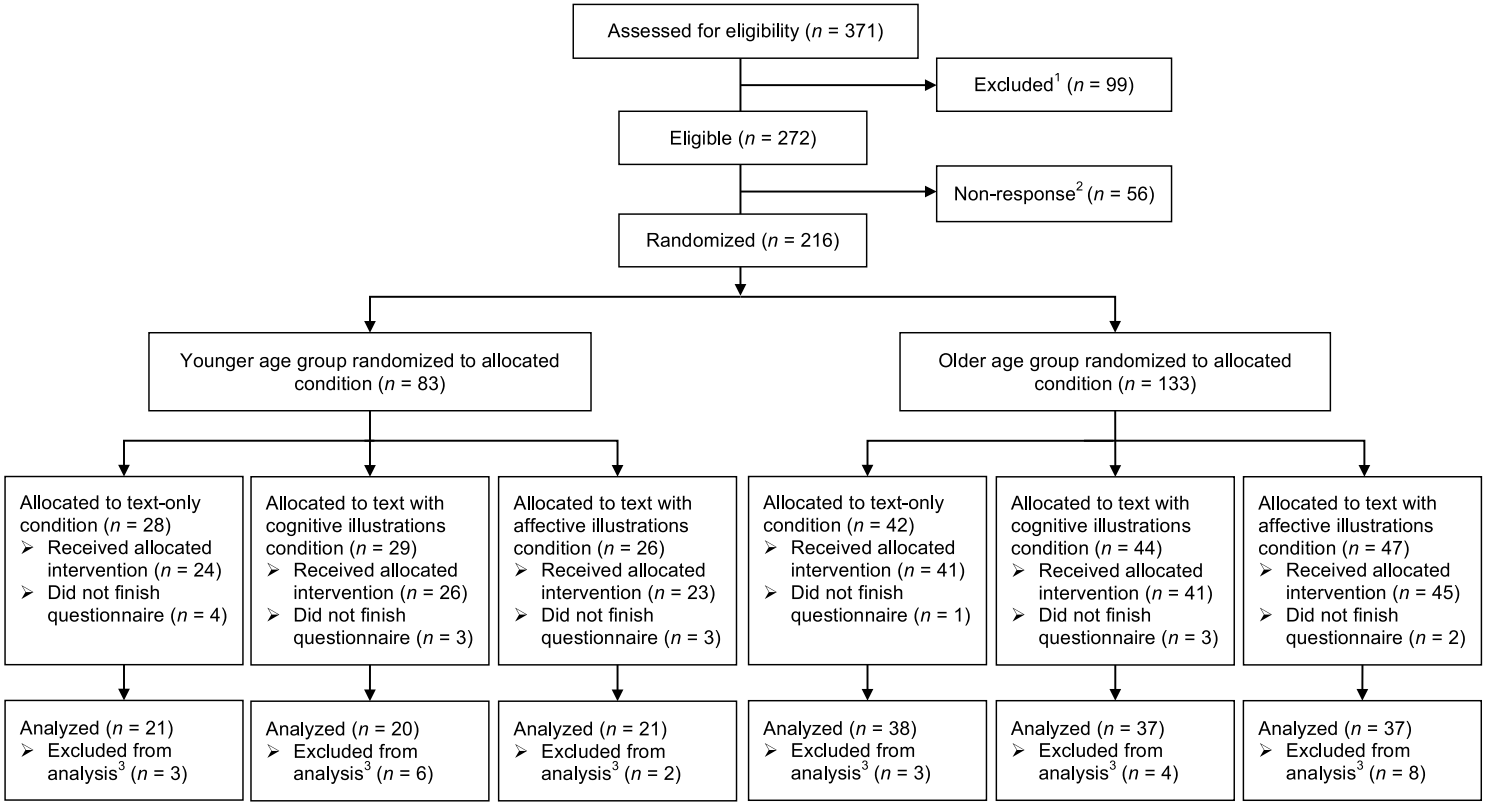

Figure 3.3. Patient recruitment flow chart.

Notes. [1]Did not have access to Internet/computer ($n = 89$), suffered from cognitive declines ($n = 4$), unknown ($n = 6$); [2]Did not feel like participating ($n = 26$), felt too sick or too tired ($n = 8$), struggled with online questionnaire ($n = 6$), felt too old to participate ($n = 3$), deceased ($n = 1$), other ($n = 3$), unknown ($n = 9$); [3]Too much prior TEM knowledge ($n = 11$), patient-reported other diagnosis than colorectal cancer ($n = 4$), did not understand the questionnaire ($n = 4$), questionnaire filled out by someone else ($n = 3$), underwent TEM ($n = 3$), duplicate ($n = 1$).

Table 3.1. Patient characteristics

Variable	All, *n* = 174	Younger patients, *n* = 62	Older patients, *n* = 112	*p*-value
Sociodemographic characteristics				
Age, mean ± *SD*	67.75 ± 9.02	58.03 ± 5.17	73.13 ± 5.50	< .001
Gender				.393
Male, *n* (%)	107 (61.5)	35 (56.5)	72 (64.3)	
Female, *n* (%)	67 (38.5)	27 (43.5)	40 (35.7)	
Education level				.336
Low education level, *n* (%)	78 (45.9)	24 (39.3)	54 (49.5)	
Middle education level, *n* (%)	48 (28.2)	21 (34.4)	27 (24.8)	
High education level, *n* (%)	44 (25.9)	16 (26.2)	28 (25.7)	
Medical characteristics				
Type of diagnosis				
Colorectal cancer, *n* (%)	174 (100.0)	62 (100.0)	112 (100.0)	NA[a]
Breast cancer, *n* (%)	3 (1.7)	1 (1.6)	2 (1.8)	1.000
Lung cancer, *n* (%)	2 (1.1)	0 (0.0)	2 (1.8)	.752
Haematological cancer, *n* (%)	1 (0.6)	0 (0.0)	1 (0.9)	1.000
Urological cancer, *n* (%)	4 (2.3)	0 (0.0)	4 (3.6)	.328
Skin cancer, *n* (%)	4 (2.3)	0 (0.0)	4 (3.6)	.328
Time since diagnosis (months), mean ± *SD*	39.71 ± 43.82	33.98 ± 18.33	42.88 ± 52.72	.200
Type of treatment				
Surgery, *n* (%)	139 (79.9)	49 (79.0)	90 (80.4)	.991
Chemotherapy, *n* (%)	72 (41.4)	33 (53.2)	39 (34.8)	.028
Radiation therapy, *n* (%)	50 (28.7)	20 (32.3)	30 (26.8)	.556
Hormone therapy, *n* (%)	3 (1.7)	0 (0.0)	3 (2.7)	.489
Immunotherapy, *n* (%)	2 (1.1)	1 (1.6)	1 (0.9)	1.000
None, *n* (%)	32 (18.4)	9 (14.5)	23 (20.5)	.437
Other, *n* (%)	20 (11.5)	10 (16.1)	10 (8.9)	.239
Treatment goal				.070
Curative, *n* (%)	156 (89.7)	59 (95.2)	97 (86.6)	
Palliative, *n* (%)	9 (5.2)	3 (4.8)	6 (5.4)	
Unknown, *n* (%)	9 (5.2)	0 (0.0)	9 (8.0)	
Other background characteristics				
Internet use, mean ± *SD*	7.45 ± 7.26	7.73 ± 7.73	7.29 ± 7.01	.707

Prior medical knowledge				
General medical knowledge[b], mean ± *SD*	2.46 ± 1.48	2.73 ± 1.65	2.31 ± 1.36	.078
Medical knowledge about colorectal cancer[b], mean ± *SD*	2.07 ± 1.42	2.37 ± 1.65	1.91 ± 1.25	.040
Medical knowledge about TEM[b], mean ± *SD*	1.52 ± 0.89	1.71 ± 0.98	1.42 ± 0.81	.038
Frailty[c], mean ± *SD*	2.15 ± 1.80	1.98 ± 1.90	2.23 ± 1.74	.383

Note. Not all figures add up to 100% due to missing data. *P*-values show (in)significant differences between the younger and older age group. *SD*, standard deviation. [a]Not applicable due to no variation in variable, that is, all patients were diagnosed with colorectal cancer. [b]A higher score indicates more knowledge, measured on a 7-point Likert scale. [c]A higher score indicates higher frailty, measured on a scale ranging from 0 to 15.

Effects of illustrations and age on website satisfaction

Adding illustrations to text information significantly increased satisfaction with the attractiveness of the website in both younger and older patients, $F(2, 168) = 6.74$, $p = .002$,$\eta_p^2 = .07$. Satisfaction with the attractiveness of the website was especially enhanced when cognitive illustrations were present ($M = 5.00$, $SD = 1.15$) as compared to affective illustrations ($M = 4.65$, $SD = 1.19$) and text-only information ($M = 4.16$, $SD = 1.44$). Yet adding illustrations did not increase satisfaction with the comprehensibility of the website compared to text-only information, $F(2, 168) = 0.50$, $p = .606$, $\eta_p^2 = .01$. Even though older patients were in general more satisfied with the emotional support from the website than younger patients, $F(1, 168) = 5.25$, $p = .023$, $\eta_p^2 = .03$, simple effects showed that this age difference only reached significance when affective illustrations were added to text, $F(1, 170) = 4.57$, $p = .034$. To summarize, cognitive illustrations increased younger and older patients' satisfaction with the attractiveness of the website, but did not increase satisfaction with the comprehensibility and emotional support. When affective illustrations were added to text information, older patients were more satisfied with the emotional support from the website than younger patients. Descriptives of the website satisfaction measures appear in Table 3.2.

Table 3.2. Effects of cognitive and affective illustrations on website satisfaction stratified by younger and older cancer patients

		Satisfaction with the attractiveness		Satisfaction with the comprehensibility		Satisfaction with the emotional support	
	n	*M*	*SD*	*M*	*SD*	*M*	*SD*
Text-only information	59	4.16	1.44	5.55	1.25	3.83	1.81
Younger patients	21	3.86	1.43	5.79	0.97	3.35	1.42
Older patients	38	4.33	1.44	5.42	1.37	4.10	1.96
Text with cognitive illustrations	57	5.00[a]***	1.15	5.86	0.98	4.15	1.28
Younger patients	20	4.98	1.09	5.77	0.99	4.09	1.31
Older patients	37	5.01	1.19	5.91	0.99	4.19	1.27
Text with affective illustrations	58	4.65	1.19	5.66	1.32	4.25	1.41
Younger patients	21	4.41	0.87	5.84	1.12	3.75	1.46
Older patients	37	4.78	1.33	5.55	1.43	4.53[b]*	1.31
Total	174	4.60	1.31	5.69	1.19	4.07	1.52
Younger patients	62	4.41	1.23	5.80	1.01	3.72	1.41
Older patients	112	4.71	1.34	5.63	1.28	4.27[c]*	1.55

Note. Website satisfaction subscales range from 1 to 7, with higher scores indicating more satisfaction with the website. *M*, mean; *SD*, standard deviation. [a]Mean differs significantly compared to the text-only information condition (main effect of condition). [b]Mean differs significantly compared to the younger patients in the text with affective illustrations condition (interaction effect). [c]Mean differs significantly compared to the younger patients in general (main effect of age). * $p < .05$. *** $p < .001$.

Effects of illustrations and age on recall of information

On average, older patients recalled less information than younger patients, $F(1, 168) = 9.19$, $p = .003$, $\eta_p^2 = .05$: whereas younger patients recalled almost half of the information correctly (49.7%), older patients recalled on average 38.6% correctly ($M_{older} = 8.49$, $SD = 5.03$ vs. $M_{younger} = 10.94$, $SD = 5.11$). Adding illustrations did not increase younger and older patients' recall of information, $F(2, 168) = 0.10$, $p = .905$, $\eta_p^2 = .00$. Nevertheless, results yielded a marginally significant interaction effect between condition and age, $F(2, 168) = 2.93$, $p = .056$, $\eta_p^2 = .03$. Simple effects analysis revealed that older patients recalled significantly less information than younger patients when information was presented as text-only information ($p = .001$) or as text with affective illustrations ($p = .036$). However, this difference disappeared when information was presented as text with cognitive illustrations ($p = .938$), indicating that cognitive illustrations improve older patients' recall of information. To summarize, older patients recall less information in general than younger patients. Nevertheless, older patients recall similar amounts of information as younger patients when cognitive illustrations are added to online text information. Recall scores appear in Table 3.3.

Table 3.3. Effects of cognitive and affective illustrations on recall of information stratified by younger and older cancer patients

			Recall of information	
	n	*Percent recall*	*M*	*SD*
Text-only information	59	40.59	8.93	5.50
Younger patients	21	53.68	11.81	5.38
Older patients	38	33.36	7.34[a]***	4.94
Text with cognitive illustrations	57	43.68	9.61	5.40
Younger patients	20	43.18	9.50	5.71
Older patients	37	44.00	9.68	5.31
Text with affective illustrations	58	43.41	9.55	4.66
Younger patients	21	51.95	11.43	4.07
Older patients	37	38.59	8.49[b]*	4.68
Total	174	42.55	9.36	5.18
Younger patients	62	49.73	10.94	5.11
Older patients	112	38.59	8.49[c]**	5.03

Note. Recall of information ranges from 0 to 22, with higher scores indicating the more information was recalled. *M*, mean; *SD*, standard deviation. [a]Mean differs significantly compared to the younger patients in the text-only condition (interaction effect). [b]Mean differs significantly compared to the younger patients in the text with affective illustrations condition (interaction effect). [c]Mean differs significantly compared to the younger patients in general (main effect of age). * $p < .05$. ** $p < .01$.*** $p < .001$.

Discussion

Considering the trend of making crucial cancer information available on the Internet, online cancer information should be presented in such a way that ageing populations are satisfied with and able to recall the presented information. Previous research on the effectiveness of illustrations has not demonstrated consistent findings on how older cancer patients in particular may benefit from illustrations when using cancer information online (Liu et al., 2009; Bol, Van Weert, et al., 2014). To the best of our knowledge, this is the first study to examine how cognitive and affective illustrations enhance website satisfaction and recall of online cancer information among colorectal cancer patients.

Our results suggest that adding illustrations benefits both younger and older patients: cognitive illustrations increased both younger and older patients' satisfaction with the attractiveness of the website as compared to text-only information. Furthermore, whereas adding cognitive or affective illustrations did not disadvantage younger patients' website satisfaction and recall of cancer information in general, older patients in particular seem to benefit from having such illustrations on a cancer-related website. The most important clinically relevant finding was that older patients' recall of information improved when cognitive illustrations were added to text information. While older patients performed substantially worse on recall of information compared

to younger patients overall (39% vs. 50%), adding cognitive illustrations to text led to improved recall of information in such a way that no statistically significant age differences in recall were observed.

Another important finding was that older patients were more satisfied with the emotional support from the website, especially when affective illustrations were added to text information. This finding further supports the ideas presented by the socioemotional selectivity theory (Reed, Chan, & Mikels, 2014). Perceiving emotional support from a website is considered an important predictor of adequate recall of information in older adults (Bol, Van Weert, et al., 2014), suggesting that affective illustrations that contribute to perceived emotional support in older patients may, in turn, motivate them to process information. This indicates that illustrations that do not serve as cues for building mental images might nevertheless be able to improve recall of information.

Previous studies have shown inconsistent findings with regard to the effectiveness of illustrations in online cancer communication with older adults. For instance, Liu et al. (2009) found that, even though older adults spent more time looking at illustrations than younger adults, they had poorer comprehension of the health-related information, and Bol, Van Weert, et al. (2014) found no benefit of adding illustrations for older adults' satisfaction and recall. The effects found in the present study might be explained by the sample under investigation. The two abovementioned studies included healthy adults, while the current study included cancer patients. The latter sample might have been more motivated to attend to cancer materials. A recent study revealed that older adults recall more information when taking the time they need to process information (Bol, Van Weert, Loos, et al., 2015). The cognitive and affective illustrations may have increased attention to the webpage, which in turn might have increased website satisfaction and recall of online cancer information among older cancer patients in particular.

Our findings have some important implications for clinical care. Online information can be offered to older cancer patients in addition to clinical encounters. Older individuals process medical information better when such information is provided through multiple sources, for instance by combining interpersonal communication (e.g., communication during clinical encounters) with media sources (e.g., the Internet) (Sparks & Turner, 2008). Websites as used in this study can be provided to cancer patients before, during or after their consultation to prepare for clinical encounters (e.g., by preparing questions to ask the doctors), seek information (e.g., about treatment options) and reduce anxiety (e.g., to seek reassurance that the doctor is doing the right thing) (Ziebland et al., 2004). Furthermore, oncologists could use cognitive illustrations as a tool to help older patients process medical information adequately during consultations.

This study has some limitations. First, we exposed patients to online cancer information about TEM in an experimental setting. Although patients were able to look at the information at their home computer, simply providing a single webpage via an online survey does not reflect how patients seek, find, appraise and act upon information they would naturally find online. Moreover, information about a relatively unknown treatment, such as TEM, might not have been perceived as relevant to our study sample. Personal relevance of information is an important motivational factor for

individuals' willingness to process information (Petty & Cacioppo, 1986). We might have, therefore, underestimated the overall effects on website satisfaction and recall of information. Nevertheless, as the information was the same across all webpages, we were still able to reveal the added value of cognitive and affective illustration in online cancer information.

Second, our sample might have underrepresented older and female patients. Older patients might have been excluded more often because of our inclusion criteria (e.g., needing to have Internet access). Even though the numbers of older adults online rapidly increase, they still use the Internet significantly less than younger adults (Statistics Netherlands, 2013a; Van Weert et al., 2014). Nevertheless, our data reveal positive effects of illustrations in online cancer information for older patients in particular, and these effects might have been even stronger when older inexperienced Internet users were also included in our study sample. The underrepresentation of women in our study might be due to the prevalence of colorectal cancer across sex: men are more likely than women to develop colorectal cancer (International Agency for Research on Cancer, 2012). Thus, even though women are underrepresented in this study, these numbers of men and women are representative for colorectal cancer populations.

Future research could focus on other beneficial communication strategies to improve older patients' satisfaction and recall of online cancer information. A growing body of research emphasizes the value of tailoring information to patients' information needs and preferences (Noar, Benac, & Harris, 2007). Research has shown that older adults yield more variety in their preference of how information is presented (e.g., in text-only format, video format) (Soroka et al., 2006), and should be considered when developing online cancer materials for older adults.

In conclusion, the results reveal an effective communication strategy to improve older cancer patients' website satisfaction and recall of online cancer information. In the current climate of making crucial cancer information increasingly available online, illustrations might be beneficial for most patients, especially older patients, although investigating individuals' specific information needs and preferences should never be neglected.