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Mediators of Fruit and Vegetable Consumption among Colorectal Cancer Survivors

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Abstract

Introduction—Due to early detection and treatment, survival from colorectal cancer (CRC) diagnosis has been steadily increasing. A CRC diagnosis could be considered a "teachable moment," a time when interventionists might successfully promote dietary changes. CRC interventions with tailored print communication (TPC) and telephone motivational interviewing (TMI) have been shown to be effective in promoting fruit and vegetable consumption (FVC) among CRC survivors. However, little is known about how these interventions work to exert their effect. This study investigated whether information processes mediate the relationship between a CRC intervention and FVC among CRC survivors.

Methods—This research used data from NC STRIDES, a study that tested the efficacy of two CRC intervention strategies to promote FVC among CRC survivors. Participants were randomized to control, TPC, TMI, or combined (TPC+TMI). Structural equation models were constructed to analyze data from 266 CRC survivors using two different measures of FVC, a 35-item and a 2-item measure.

Results—Two information processes, relevance of communication and trust in the communication, mediated the effect of TPC+TMI on FVC for both 35-item and 2-item measures. TPC+TMI was significantly associated with relevance of communication, and perceiving greater relevance was significantly related to trust in the communication. Trust was significantly related to FVC.

Discussion—Information processes, including relevance and trust in the communication, serve as mediators of the relationship between the CRC intervention and FVC.

Implications for Cancer Survivors—Future intervention research should investigate ways to enhance relevance of communication and trust in interventions with CRC survivors.

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Keywords

information processing; colorectal cancer survivors; colorectal cancer intervention; fruit and vegetable consumption

Introduction

Colorectal cancer is the third most common cancer in the United States, and the second leading cause of cancer death [1]. With improvements in early detection and treatment, survival from colorectal cancer (CRC) diagnosis has been steadily increasing. Literature suggests that having a cancer diagnosis may increase individuals' motivation to change their health behavior [2,3]. Specifically, cancer survivors may increase their perceptions of personal vulnerability and their motivation to reduce risks associated with their cancer diagnosis [2,3].

Interventionists may successfully capitalize on the "teachable moment" [4] prompted by a cancer diagnosis to motivate individuals to make lifestyle changes that can improve their overall health and well-being [5]. In fact, lifestyle changes such as eating more fruits and vegetables have been shown to protect against cancer recurrence and cancer specific mortality [6,7]. Furthermore, a cancer diagnosis may inspire motivation for lifestyle change and a number of studies show that interventions directed at dietary changes among cancer survivors are effective [4,5]. Studies of women with breast cancer suggest that participants who received clinic-based counselor contact had large increases in daily intake of fruits and vegetables at 12 months [8]. A multiple-cancer-site, survivors-focused intervention, Fresh Start, showed that interventions using newsletters tailored for diet and exercise improved overall diet quality, including increased daily intake of fruits and vegetables, and decreased intake of fat [5]. Interventions strategies such as tailored newsletters and counselor contact are effective and successful at motivating and promoting healthy dietary changes among cancer survivors [5, 8].

However, little is known about how dietary interventions directed at cancer survivors work to produce their effect. Studies examining intervention effectiveness have found that information processing may play an important role in helping individuals make the decision to eat more fruits and vegetables [9]. Information processing refers to an individual's cognitive effort to attend to an intervention message and the involvement with the topic of the message [10]. Reports from a handful of studies on information processing among the general population indicate that information received appears to influence attitude change, decision-making, and ultimately behavior change [9,11–13]. Given the openness of CRC survivors to adopting healthy behaviors, and the benefits that dietary interventions can provide to these individuals, large health gains may result from better understanding information processing by CRC survivors to maximize intervention effectiveness.

This study examined information processing of CRC survivors guided by two information processing models: McGuire's information processing model and the Elaboration Likelihood Model. McGuire's information processing model explores ways that persuasive communications can change attitudes and behaviors [14,15]. In this input/output model,

input factors, such as source of message or channeling of information, can influence 12 output factors [14,15]. Output factors, or outcomes of communication, range from perceptive (e.g., attention) and cognitive (e.g., retrieval) effects to behavioral change. Information processing theory proposes that, for a communication to achieve behavior change, outcomes appearing earlier in the sequence have to be achieved [14,15]. For example, health communication materials should be more effective at changing behavior if the recipients are *exposed* to the communication, *attend* to it, *learn* from it, and *recall* the information received.

Another communication model, the elaboration likelihood model (ELM), asserts that people are more likely to process information thoughtfully if they perceive it as personally relevant [16,17]. The ELM is based on the assumption that people are active information processors. When the arguments used in a communication are seen as important or as personally relevant to recipients, this information is processed more deeply, and the expected change in attitude will be greater, than if the information is deemed of little relevance to receivers [16,17]. That is to say, when message recipients contemplate information carefully, relate new information to previously encountered information, and consider the messages in the context of their own previous life experience (i.e., processes the information more elaborately) then the message is seen as personally relevant. Furthermore, research has found that greater elaboration of is associated with better retention, recall, and permanent attitude and behavior change [9,13,17–18].

CRC cancer survivors' experiences with their threatening illness may affect how they process information. First, a cancer diagnosis may lead individuals to seek more information about cancer, including its diagnosis, treatment, and treatment side effects, as well as available resources to maintain their health [19,20]. This information-seeking behavior, in turn, can lead CRC survivors to understand more about their illness, and possibly about other health topics, than individuals without a CRC diagnosis. Being more knowledgeable about a topic may predispose survivors to think more critically, affecting how they process new information [17]. Additionally, CRC survivors may experience negative psychological outcomes, which also might affect their information processing. For example, CRC survivors face uncertainty about their health, often reporting fear of cancer recurrence or of developing secondary cancers [21]. They also report more anxiety [22] and more depression [23]. These psychological states may affect whether individuals have positive thoughts about new information, and how any new information is processed or elaborated [14–16]. Identifying essential information processes among CRC survivors, therefore, can help researchers advance the current state of our knowledge about interventions, and enhance different processes for different subgroups to maximize effectiveness [24,25]. The purpose of this study was to identify the information processes that mediate the relationship between two CRC interventions and fruit and vegetable consumption (FVC) among CRC survivors.

Conceptual Model

Guided by the information processing model and the elaboration likelihood model, we developed a new conceptual model to examine the relationship between a CRC intervention, information processes, and FVC (Figure 1). As shown, the relationship between the CRC

intervention and FVC can occur directly as well as indirectly through relevance of communication, trust in the communication, and/or dose recall. The relationships between intervention and information processes, and between information processes and FVC, have been demonstrated previously in the literature [9,11–12]. These studies, however, have not tested for the mediating effect of information processes on health communication and FVC on CRC survivors.

Methods

Sample

This study used data from the North Carolina Strategies to Improve Diet, Exercise, and Screening study (NC STRIDES). NC STRIDES used a classic 2 × 2 randomized factorial design that tested the efficacy of two CRC health communication strategies to promote FVC among CRC survivors and non-CRC members of the general population. The study sample was drawn from an existing population-based case control study of risk factors for CRC [26]. NC STRIDES tested the effectiveness of two different strategies, tailored print communications (TPC) and telephone-based motivational interviewing (TMI) in increasing FVC. Participants were randomized into one of four groups: control, tailored print communication (TPC), telephone motivational interviewing (TMI), or combined (TPC +TMI). The control group received two generic health education mailing, the TPC only group received a series of four individually-tailored, printed newsletters, the TMI only group received a series of four brief telephone motivational calls, and the combined group received four individually-tailored, printed newsletters and four motivational calls. NC STRIDES was conducted from January 2001 through June 2002 in 33 counties of North Carolina. The intervention has been described in detail previously [26–28].

Study participants from NC STRIDES were recruited from the North Carolina Colon Cancer Study (NCCCS), a population-based case-control study of colon cancer in North Carolina conducted from 1996-2000. NCCCS study participants were from 33 counties in the central and eastern part of North Carolina, an area including rural, suburban, and urban counties whose residents represent diverse socioeconomic backgrounds, although primarily African Americans and whites. Eligible CRC cases were individuals with adenocarcinomas of the colon, ages 40-80, of non-Hispanic ethnicity, who were being treated in one of 38 non-federal hospitals. Cases were identified using a rapid ascertainment system of the North Carolina Central Cancer Registry. Population-based controls or non-CRC members of the general population in the NCCCS were recruited from two sources: those under age 65 came from the NC Department of Motor Vehicles roster and those over age 65 came from the registry of the Center for Medicare and Medicaid Services. Detailed recruitment procedures have been described previously [26–28]. NC STRIDES recruited 922 participants (49.8%), of whom 825 individuals (89.5) completed the baseline survey (304 CRC cases and 521 controls). Of those 825 participants, 735 (89.1%) completed the follow-up survey (266 CRC cases and 469 controls). Non-responses on the follow-up survey were due to 18 deaths, 21 people who withdrew from the study for health reasons, 19 refusals, and 32 lost contacts.

Because a CRC cancer diagnosis may affect how individuals process information [14,15], separate analyses were conducted for CRC cancer survivors and for the non-CRC members

of the general population. The findings of the general population (non-CRC members) have been reported previously [13]. The analyses for this study, therefore, used only data from the CRC survivors (N=266).

Data Collection

Researchers collected baseline data for NC STRIDES using a telephone-administered self-report survey. Surveys took, on average, 30 to 40 minutes to complete. Data collected included socio-demographic information, self-rated health, health information, FVC, psychosocial factors related to FVC, and communication measures. One year after baseline, participants were asked to complete a second telephone survey. That survey lasted about 45 minutes, asked the same health, behavioral, and psychosocial questions as the baseline survey, and also included information processing questions.

Participants' baseline age was 65 years old (± 10.5) (Table I). More than half of the participants were white (62%), male (52%), and had an annual income of greater than $30,000 (52%). Most had some high school education or had completed high school. About one-third (38%) were employed either full-time or part-time. Participants reported that, on average, they ate 5 servings of fruits and vegetables a day. Across intervention types, there were no significant differences in demographics except in annual income. Participants who received both the tailored print communication and telephone motivational interviewing (TPC+TMI) intervention were more likely to have an annual income greater than $30,000 compared to other intervention groups (control = 52%, TPC = 42%, TMI = 48%, and TPC +TMI= 68%, $p = 0.036$).

Measures

Dependent Variable

Fruit and vegetable consumption: Average daily FVC was measured using a 36-item modified version of the Block food frequency questionnaire (FFQ), validated by Resnicow and colleagues [29] in a diverse Southern population. Resnicow's tool was slightly modified to ask how often food was consumed in the last *month* as opposed to the last *week*, and to omit food items that were not fruits and vegetables. For analysis purposes, the item "French fries, fried potatoes, or home fries" was eliminated from calculations; thus the FVC total was based on 35 items. Fruit and vegetable item frequencies were converted to servings/day and then summed to provide total daily consumption values for fruits, vegetables, and total fruits and vegetables. The distribution of FVC was skewed to the right; therefore, we employed a log transformation (ln + 1) to improve normality. In addition to the FFQ, participants were asked to estimate their consumption of fruit and vegetable per day using a brief 2-item screener ("How many servings of [(vegetables and/or vegetable juices) (fruit or fruit juices)] do you usually have during a single day?"). The screener served as a second estimate of FVC that we expected to be less subject to over-reporting of fruits and vegetables, which can occur with long FFQ instruments.

Mediator Variables: Information Processes—*Relevance of communication* was defined as the relevance of the intervention's communication to the participant's life. Three indicators measured this concept: (1) "How important to you personally was the information

in the newsletter," (2) "How much did you feel that the newsletters were designed especially for you," and (3) "How much did the information in the newsletters apply to your life." The response categories ranged from 1 (*not at all*) to 5 (*completely*). For participants receiving TMI, the three questions were asked about phone calls instead of newsletters. For those receiving the combined intervention (TPC+TMI), the same questions were asked about both newsletters and phone calls. The mean of the questions on newsletters and phone calls was calculated for those receiving the combined intervention. Cronbach's alpha showed good reliability for the three questions on newsletters ($\alpha = .73$) and phone calls ($\alpha = .76$) and high reliability for the mean of the two ($\alpha = .94$).

Trust in the communication was measured with one question: "How much did you trust that the information in the newsletter was accurate?" Response categories ranged from 1 (*not at all*) to 5 (*completely*). For participants receiving TMI, the question asked about phone calls instead of newsletters. For those receiving TPC+TMI, the question asked about both newsletters and phone calls. The mean of the questions on newsletters and phone calls was calculated for those receiving the combined intervention.

Dose recall was defined as participants' ability to recall the number of intervention communications that they received, and was measured by the question: "How many newsletters do you remember receiving?" The answers ranged from 1 to 5, where 1 = 1, 2 = 2 newsletters, 3 = 3 newsletters, 4 = 4 newsletters, and 5 = more than 4 newsletters. For participants receiving TMI, the question asked about phone calls instead of newsletters. For those receiving the combined intervention (TPC+TMI), questions were asked about both the newsletters and phone calls. The mean of the questions on newsletters and phone calls were calculated for those receiving the combined intervention.

Independent Variable

Intervention: Participants were randomized to four groups: control, tailored print communication (TPC), telephone motivational interviewing (TMI), and combined (TPC +TMI).

Other Variables

Demographic variables: Age was collected as a continuous variable and calculated using the date of birth and the date of the interview. Race was collected as white and African American. Gender was collected as male or female. Education was assessed as the highest grade of school completed and used as a categorical variable with options of "8 years or less," "9–12 years," and "13+ years." Employment status was measured with three questions: whether participants were currently employed; how many hours they worked per day; and how many days they worked per week. The responses were used to dichotomize the employment status as yes/no and part-time employment was counted as "yes." Annual income asked about total yearly household income and included 6 categories: "less than $10,000," "$10,000 – $19,999," "$20,000 – $29,999," "$30,000 – $49,999," "$50,000 – $74,999," and "$75,000 or more." These categories were dichotomized as less than $30,000 or greater than equal to $30,000.

Analysis

Data formatting, management, and descriptive statistics were conducted using SAS version 9.2. Descriptive statistics were generated using chi-square analyses for categorical variables and t-test and ANOVA for continuous variables. Alpha level of 0.05 (2-tailed) was used for all analyses. We constructed structural equation models to identify the information processes that mediate the relationship between the CRC interventions and fruit and vegetable consumption (FVC). The model was estimated using MPLUS version 4.2.

Criteria for Establishing Mediation

Evidence of mediation requires statistically significant intervention effects on both hypothesized mediator variables (information processes) and the outcome variable (FVC). It also requires a statistically significant mediator effect on the outcome variable (FVC) while controlling for the intervention effect, and a reduction in the intervention-to-FVC relationship when the predictor variable is controlled [30]. The structural equation model (SEM) provides a multivariate method for evaluating mediation by first allowing the user to evaluate the effect of the intervention on the outcome (Model 1). A second model (Model 2) is tested to simultaneously evaluate the effects of the intervention on the proposed mediators and their effects on the outcome [31].

Model Fit

Multiple fit indices were used to assess model fit. These included the chi-square test statistic, the Root-Mean-Square-Error of Approximation (*RMSEA*), the Standardized Root Square Mean Residual (*SRMR*), the Comparative Fit Index (*CFI*), and the Tucker-Lewis Index (*TLI*). With a large sample size, the chi-square test is not a reliable method for assessing model fit [32]. Thus, we relied on standard cutoff recommendations for the *RMSEA*, *SRMR*, *CFI*, and *TLI* [32]. For the *RMSEA* and the *SRMR*, values approximating 0.05 indicate close fit. For the *CFI* and the *TLI*, values greater than or equal to 0.95 suggest a model with proportionate improvement in fit from the baseline model. When models were just identified, i.e., when the number of observable variances and covariances equaled the number of parameters of the model to be estimated, the fit indices could not be used to evaluate the model fit.

Model Specification

The SEM was built to test the relationship between the hypothesized variables, including the intervention variables, mediating variables, and FVC. We first performed a confirmatory factor analysis to evaluate a measurement model of the hypothesized model. Next, SEM was specified to test the relationship between the hypothesized variables, with intervention variables as covariates as shown in Figure 1. The model was first built for the 35-item measure of FVC, and another model was built for the 2-item measure of FVC.

Results

Measurement Model

Before testing the structural model, the viability of the proposed latent factor was first established through the use of a confirmatory factor analysis measurement model. Measurement models confirmed that the variables (especially designed for self, importance of the communication received, and communication applicable to life) hypothesized to form relevance of communication were sufficiently empirically-related to reliably form one factor. All variable loadings on the hypothesized latent factor were found to be strong and significant. The fit indices could not be evaluated because the model was just identified. The variable loadings on the latent factor are summarized in Table II.

Mediation Analysis of Colon Cancer Intervention Strategies, Information Processes, and FVC

Intervention group did not have a significant direct effect on FVC using the 35-item measure. However, we observed a statistically significant increase in FVC on the 2-item brief measure for all intervention groups compared to the control group (TPC: $\beta = 0.57$, $p = 0.05$; TMI: $\beta = 0.78$, $p < 0.05$; TPC+TMI: $\beta = 0.99$, $p < 0.05$).

The SEM testing the hypothesized relationship between intervention, information processes, and 35-item measure of FVC had a good fit with χ^2 (29, $N = 266$) =49.55, $CFI = 0.98$, $TLI = 0.974$, $RMSEA = 0.052$, and $SRMR = 0.045$. Two additional paths were specified as indicated by modification indices and were deemed conceptually sensible [33]. These paths were between perception of relevance of communication and dose recall, and between trust in the communication and FVC. The modified model with these additional two paths improved the model fit with χ^2 (27, $N = 266$) =31.52, $CFI = 0.99$, $TLI = 0.99$, $RMSEA = 0.025$, and $SRMR = 0.027$. The path estimates are shown in Figure 2.

The relationship between intervention and the 35-item measure of FVC was mediated through information processes among CRC survivors who received the combined intervention only. Receiving a combination of TPC and TMI was significantly related to the perception that the communication was relevant ($\beta = 0.41$, $p = 0.05$). Perceiving greater relevance was significantly related to trust in the communication ($\beta = 0.99$, $p < 0.001$), and greater trust was significantly related to eating more fruits and vegetables ($\beta = 0.50$, $p = 0.002$). Neither intervention alone was significantly mediated by information processes.

The mediation effect was also significant for the combined intervention and the 2-item measure of FVC, and this model had a good fit with χ^2 (27, $N = 266$) =36.15, $CFI = 0.99$, $TLI = 0.98$, $RMSEA = 0.036$, and $SRMR = 0.033$ (Figure 3). The combined intervention was significantly related to relevance of communication ($\beta = 0.48$, $p < 0.05$). More relevance of communication was significantly related to greater trust in the communication ($\beta = 0.99$, $p < 0.001$), and greater trust was significantly related to eating more fruits and vegetables ($\beta = 0.41$, $p < 0.05$). Similar to the 35-item measure, receiving either intervention singly was not significantly mediated by information processes.

Discussion

This study examined the mediational relationship between a colorectal cancer (CRC) intervention, information processes, and FVC among CRC survivors. The relationship between intervention condition and FVC was mediated by information processes, but only for those who received the combined intervention (TPC+TMI). Both the 35-item and the 2-item measures were mediated by similar information processes. Receiving the combined intervention appears to be responsible for the indirect effect on FVC through information processes, not whether the information was delivered through tailored print communication (TPC) or telephone motivational interviewing (TMI).

The combined intervention had its indirect effect on FVC via two information processes, relevance of communication and trust in the communication. Research has shown that tailoring communications makes them more likely to be perceived as personally relevant, and communications seen as more relevant are more likely to be processed or elaborated [11,13,17]. That is, the individual who finds the communication personally relevant contemplates the information carefully, relates new information to previously encountered information, and considers the communication in the context of his or her own previous life experiences. Both TPC and TMI interventions were tailored for individual participants, and CRC survivors processed information through a communication's relevance.

Trust in the communication was another important process for CRC survivors. Research suggests that CRC survivors are generally more knowledgeable about CRC and also report more information needs compared to non-cancer survivors [34] leading them to seek still more information about their illness [19,20]. Prior knowledge may have served as a point of reference to which new information is compared and judged as trustworthy and credible [16]. In our study, upon being exposed to the intervention, CRC survivors may have been stimulated to reflect on the information that they already possessed as well as their own life experiences with cancer. These processes, in turn, may have let them to accept or dispute the new information that they subsequently have received. Depending on whether they agreed or disagreed with the new information, individuals may have drawn conclusions about the credibility and trustworthiness of the communication.

For those who received both TPC and TMI, receiving the intervention through two different strategies appears to have stimulated information-processing among CRC survivors. This result may be due to receiving multiple communications through two different intervention strategies. Previous studies examining the effect of dose and repetition suggest that repetition beyond the first three messages adds little to the positive effect, and may even diminish impact [35,36]. Other researchers have reported that, although attention to and interest in a communication decline with repetition, the decline can be reversed when communication includes new, relevant arguments [14–16,37]. CRC survivors in the combined intervention group received four tailored newsletters and four counseling calls. It is possible that receiving the intervention through two different strategies may have kept the participants interested and engaged in the intervention, and the strategies may have reinforced each other.

It is important to note that, although we did not find a significant direct relationship between the combined intervention and the 35-item measure of FVC, we found an indirect effect through relevance of and trust in the communication. Failing to detect a direct effect is not uncommon; indeed, several researchers have questioned the necessity of testing a direct association, particularly in an experimental study [31,38]. For example, Shrout and Bolger [38] explain that when mediation involves proximal causal processes and when the intervention is a strong agent of change in the outcome, then a significant direct effect may be found. When it involves distal causal processes, however, the direct effect may be absent and the mediation effect may be larger, because it assesses the relationship between more proximal variables (intervention to mediator and mediator to outcome). Thus, these researches recommend that investigators not be rigid about the presence of an overall direct effect when testing mediational models [38].

Additionally, of interest was that the mediation pathway for the 35-item measure was similar to that for the 2-item measure, where this study did find a significant direct effect. The consistency in the mediation effect across two measures indicates that the effect of the combined intervention on FVC occurred through information processes. It is also important to note that, although we found a direct effect between TPC or TMI and the 2-item measure of FVC, we did not find an indirect relationship through information processes. This finding does not suggest that there is no mediating effect, but rather that any effect was not mediated through relevance of communication or trust in the communication. Future research is warranted to examine why information processes did not mediate these single interventions impact on FVC, and whether there may be other mediation pathways among CRC survivors.

This study has several strengths. First was our ability to extend previous findings by conceptualizing information processes as mediators of health communication and FVC. Past studies reported a significant bivariate relationship between intervention and information processes, as well as a relationship between information processes and behavior change [9,12]. We extended that earlier research by conceptualizing and empirically testing theory-based information processes as mediators of health communication and FVC. This study also allows some generalizability of the results across CRC survivors, as the participants from this study were a diverse group of people, including 48% females and 38% African Americans.

The limitations of the study include that the data were collected as part of a larger study that was not designed for testing information processes. Therefore, not all potential information processes were included in the conceptual model, and variable selection was dependent on the variables available from the original study dataset. McGuire [14,15], however, states that it is not necessary to include all information processes in empirical studies. Finally, the data were retrospective self-reported, which may leave them open to recall bias. It is likely, however, that randomization minimized any bias across the four study groups.

In conclusion, this research provides evidence that information processes can be considered as mediators of the relationship between a CRC communication intervention and FVC among CRC survivors. A cancer diagnosis may be a “teachable moment” to successfully promote dietary intervention among CRC survivors. Interventions that focus on FVC among

CRC survivors may be evaluated with regard to their potential for increasing survivors' perceptions of communication relevance of communication and trust in the communication. As intervention studies continue to evolve, special attention paid to information processes and elaboration may yield a more refined understanding of what kinds of processes "matter" for which types of interventions, and for whom, as well as the potential influence of information processes on health behaviors.

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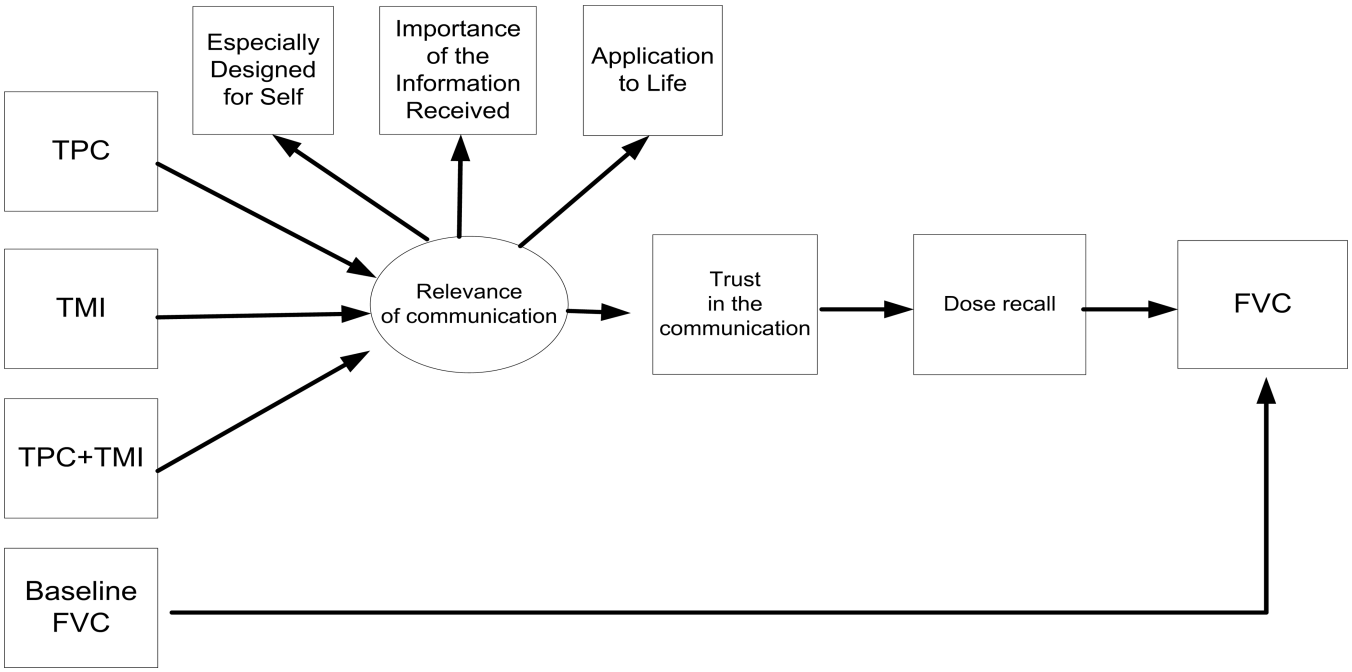

Figure 1.
Conceptual model depicting the relationship between intervention, information processes, and fruit and vegetable consumption

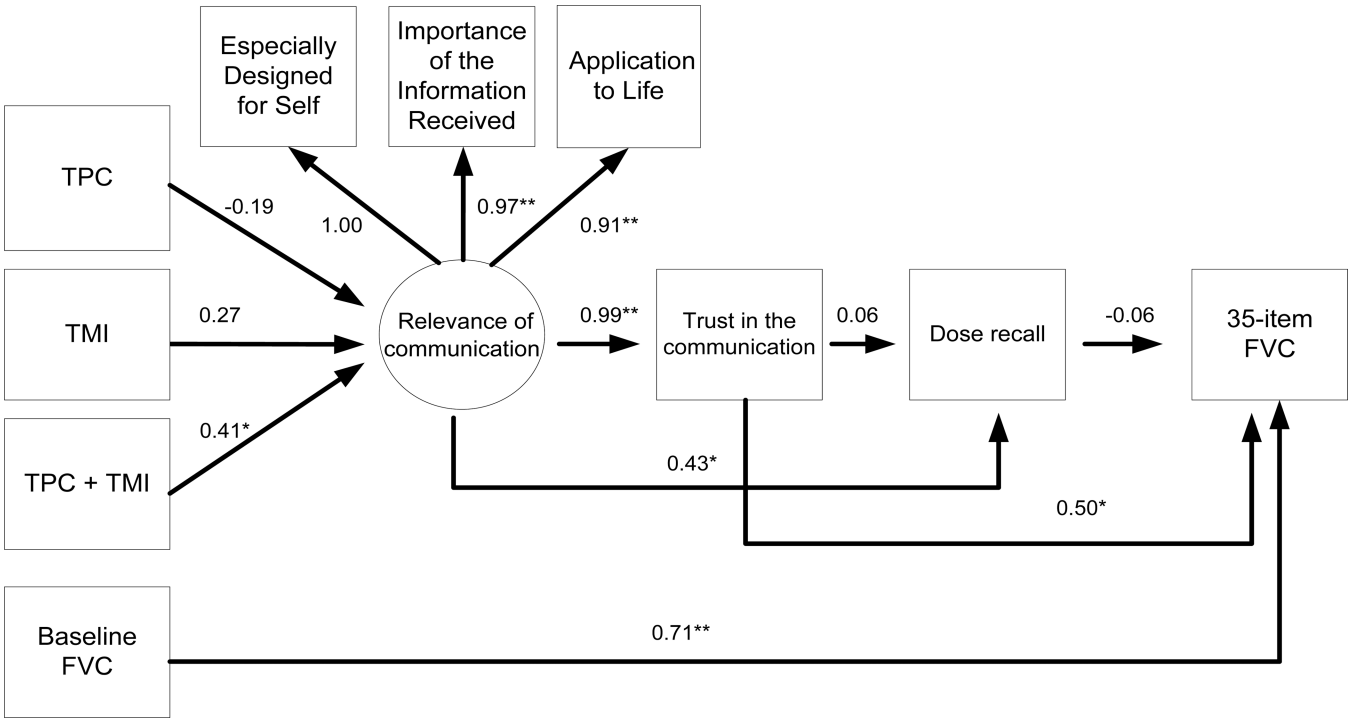

Figure 2.

Path diagram of model testing information processes as mediators of the association between intervention and 35-item measure fruit and vegetable consumption, adjusting for baseline fruit and vegetable consumption. Unstandardized β weights for variables entered into the model are shown. Significant relationships are indicated by asterisks (*$p < .05$, **$p < .001$).

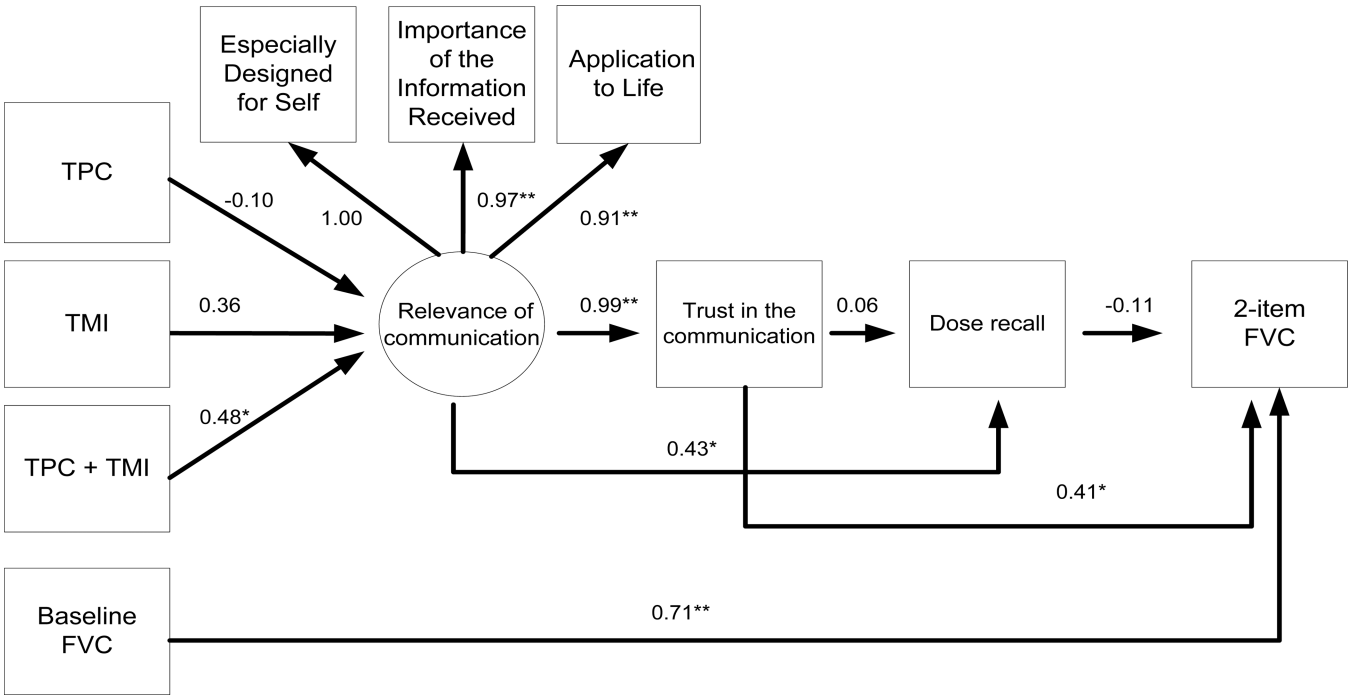

Figure 3.

Path diagram of model testing information processes as mediators of the association between intervention and 2-item measure fruit and vegetable consumption, adjusting for baseline fruit and vegetable consumption. Unstandardized β weights for variables entered into the model are shown. Significant relationships are indicated by asterisks (*$p < .05$, **$p < .001$).

Table I

Demographic Characteristics of Colorectal Cancer (CRC) Survivors by Intervention Type

Variable	Total N = 266	Control N = 66	TPC[2] N = 70	TMI[3] N = 72	TPC+TMI N = 58	P-value
Age in Years						
Mean (SD)	65.0 (10.5)	65.1 (10.6)	64.8 (11.3)	66.6 (9.7)	63.2 (10.4)	0.325
Race, % (N)						
White	62% (166)	70% (46)	69% (48)	54% (39)	57% (33)	0.141
Sex, % (N)						
Male	52% (138)	58% (38)	46% (32)	57% (41)	47% (27)	0.345
Employed, % (N)						
Yes	38% (99)	35% (23)	37% (26)	31% (22)	49% (28)	0.225
Annual Income, % (N)						
≥ $30,000	52% (126)	52% (31)	42% (27)	48% (32)	68% (36)	0.036
Education, % (N)						
8 years or less	11% (28)	6% (4)	16% (11)	13% (9)	7% (4)	0.455
9–12 years	44% (118)	44% (29)	47% (33)	42% (30)	45% (26)	
13+	45% (119)	50% (33)	37% (26)	45% (32)	48% (28)	
Daily FVC[1], Mean (Median)	5.4 (4.8)	5.1 (4.7)	5.3 (4.9)	5.7 (4.6)	5.7 (4.9)	0.32

[1]FVC = fruit and vegetable consumption,

[2]TPC = tailored print communication,

[3]TMI = telephone motivational interviewing

Table II

Summary of Confirmatory Factor Analysis Measurement Models

	Unstandardized Coefficient (SE)	Standardized Coefficient	R-Square
Variable Loading on Latent Factor: Relevance of Communication			
Especially Designed for Self	1.00†	0.92	0.85
Importance of the Message	0.97 (0.04)**	0.94	0.89
Message Application to Life	0.92 (0.04)**	0.93	0.86

† Variable loading was set to equal to 1.00 to set the metric for the factor.

** denotes $p < .001$.