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Emotional Barriers to Bowel Screening in Italy: Scale Psychometric Properties and Effects on Screening Attendance

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Running Head: Emotional Barriers to Bowel Screening in Italy

Abstract

Objective: To assess a three-factor version of the Emotional Barriers to Bowel Screening (EBBS) scale; analyze the scale's psychometric properties; and investigate the associations of fecal disgust, embarrassment, and fear with colorectal cancer (CRC) screening avoidance.

Methods: Retrospective design: We asked participants to rate negative emotions associated with CRC screenings as well as whether they had ever attended a fecal occult blood test. Sample: 268 Italian adults aged 45–74 years. Measures: negative emotions, screening knowledge, CRC risk perception, demographic and background data, and hypothetical medical help-seeking. Analyses: Confirmatory factor analyses, correlations, logistic regressions.

Results: The EBBS scale is a multidimensional instrument and, at least where fecal tests are of interest, can be used without the insertion disgust subscale. The analyzed negative emotions were negatively correlated with screening attendance and positively correlated with intention to delay seeking medical help. However, logistic regression models showed that, of the three analyzed emotions, fear about outcome was the only significant predictor of screening behavior and delaying medical care.

Conclusions: Further studies can adopt the version of the EBBS scale that is most suitable for their research contexts. Interventions must be designed to reassure patients.

Keywords: Cancer, Colorectal Neoplasms, Disgust, Embarrassment, Emotions, Fear, Mass Screening, Perception, Psycho-oncology, Oncology

Abbreviations: Colorectal cancer (CRC); Confirmatory factor analysis (CFA); Emotional Barriers to Bowel Screening (EBBS); Fecal Occult Blood Test (FOBT)

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Introduction

Colorectal cancer (CRC) is one of the most common and deadliest malignancies (1). However, CRC screening can detect this disease in its earliest stages, thus reducing its incidence and mortality (2). Hence, improving CRC screening participation rates, which are still suboptimal (3), is an important health goal.

Several studies, applying a social psychological approach, detected various predictors of screening attendance and avoidance (e.g., 4). Of these predictors, emotions play a particularly central role (5). The role of disgust, embarrassment, and fear in hindering patients' CRC screening participation (5–9) and treatment (10) is well documented. However, studies on emotions and CRC screening typically focused on only one of these negative affects (e.g., 8,11,12). This methodological approach is problematic, as embarrassment, fear, and disgust tend to co-vary (5).

The Emotional Barriers to Bowel Screening (EBBS) scale (5,13) was developed specifically for the simultaneous study of fecal disgust, insertion disgust, embarrassment, and fear. The scale remained unpublished until 2017, when Davis et al. (14) suggested that the EBBS scale might be a unidimensional measure of fecal aversion in the CRC screening context. In 2018, Reynolds et al., authors of the EBBS scale, published a first revision of the scale, reducing the number of items from 20 to 15 (5). That study confirmed the validity of the EBBS scale and its previously contested multidimensionality, as the confirmatory factor analysis (CFA) yielded four components with eigenvalues over .70. Nevertheless, the unidimensional and multidimensional EBBS models were never formally compared.

The first purpose of the present study was to test how many dimensions the EBBS scale measures. This analysis sheds light on how future work should use this instrument. We did not adopt the original four-component EBBS scale but rather used a three-factor version: Our second purpose was to propose a version of the EBBS scale that might be a better research instrument for screening programs based on fecal-collection tests, as there is no scale specifically developed for these contexts. Therefore, we removed the subscale measuring insertion disgust (i.e., disgust elicited by the perceived violation of the body envelope). In screening programs where colonoscopy is only a diagnostic exam that follows a positive fecal occult blood test (FOBT)—like those in Italy, where this study was carried out—the insertion disgust items might place undue emphasis on colonoscopy.

Finally, the present study is the first to use an Italian sample to investigate fecal disgust, embarrassment, and fear associated with CRC screening avoidance. We assessed avoidance using measures of self-reported past CRC screening attendance and decisions to delay seeking medical help (5).

In human evolution, the functions of disgust, embarrassment, and fear were to protect one's body and avoid, respectively, contaminants, social exclusion, and menaces (5). In a context of FOBT screening, which involve the collection of a stool sample, people might feel especially disgusted (due to contact with a potential contaminant, 7) or embarrassed (as contact with fecal matter is a violation of social norms, 8, and a cultural taboo, 15). Some people may also refuse to attend screening because they are afraid of receiving bad news (16). Hence, we expected that fecal disgust, embarrassment, and fear would be negatively correlated with the likelihood of having attended CRC screening (First Hypothesis, H1; Second Hypothesis, H2; and Third Hypothesis, H3, respectively) and positively correlated with the likelihood of delaying seeking

medical help when suffering from bowel illness (Fourth Hypothesis, H4; Fifth Hypothesis, H5; and Sixth Hypothesis, H6, respectively). We also expected that the perception of fecal disgust, embarrassment, and fear would be negatively associated with the likelihood of having ever attended CRC screening (Seventh Hypothesis, H7; Eighth Hypothesis, H8; and Ninth Hypothesis, H9, respectively) and the likelihood of delaying seeking medical help (Tenth Hypothesis, H10; Eleventh Hypothesis, H11; and Twelfth Hypothesis, H12, respectively), even after controlling for other relevant factors.

Method

Participants and procedure

We invited people aged 45 and older living in Italy and with no prior history of colorectal cancer to complete an online questionnaire on the Qualtrics survey platform. Participants were recruited through snowball sampling (posts on social media and the authors' personal contacts). We offered no remuneration for participation. We automatically excluded participants who did not meet our inclusion criteria (being at least 45 years old, living in Italy, and having no prior history of colorectal cancer). Data were collected over the course of four weeks (November 11–December 2, 2020). A total of 509 individuals accessed the online questionnaire. Of these, 241 were excluded because they I) did not meet the inclusion criteria (n = 105), II) did not give their consent for data analysis (n = 13), or III) did not complete the EBBS items (n = 123). The final sample consisted of 268 participants (Table 1). Our measures and data analyses closely followed the procedure of the previous EBBS revision (5) to test a version of the EBBS scale that included only three emotion subscales: fecal disgust (produced by fecal exposure), embarrassment (related to the social taboos violated by this type of screening), and fear of a negative outcome (concerns about a possible cancer diagnosis).

<< Table 1>>

Measures

After participants gave their informed consent, the study began with the presentation of a CRC Italian screening program. Specifically, participants read a text explaining that, in Italy, people between 50 and 74 years old are offered CRC screening every two years. The invitation letter is sent by mail, while the FOBT kit is collected by hand at pharmacies. Citizens are only invited for further tests if the FOBT is positive. The questionnaire then continued with the EBBS scale items, questions about CRC screening knowledge, CRC risk perception, hypothetical decision-making about seeking medical help for bowel problems, and background information (demographic data, having ever discussed CRC screening with a doctor, CRC familiarity, and self-reported past CRC screening attendance).

Reduced EBBS scale. The EBBS scale (5) consists of 15 items measuring perceptions of fecal disgust, insertion disgust, embarrassment, and fear about CRC screening. To develop a more suitable instrument for studying psychological barriers to FOBT screening in contexts where endoscopic tests are a follow-up exam, we tested a 10-item version of this scale that excluded the insertion disgust subscale. The selected 10 items comprising the EBBS scale were translated and adapted into Italian by the authors. The scale was then back-translated into English by a professional service and compared with the original version. Participants expressed their agreement (on a five-point scale) with sentences about the perception of negative emotions in the CRC screening context. Items were presented in randomized order. We replaced missing values with the variable mean. For each EBBS subscale, we obtained a single score summing individuals' answers to the respective items. A higher score indicates a stronger emotional response.

CRC screening knowledge. CRC screening knowledge was measured as a predictor of self-reported screening participation and hypothetical medical help-seeking. The items used to assess knowledge were adapted for the Italian context from a measure developed for the United Kingdom CRC screening program (17). Participants rated 10 statements as true or false. Items were presented in randomized order. We coded correct answers as 1 and then summed items to obtain a total knowledge score. Participants could read the correct answers at the end of the questionnaire.

CRC risk perception. Participants were asked whether they thought their risk of developing CRC was "lower" (–1), "about the same" (0), or "higher" (1) in comparison with other people of their own age (18).

Demographic and CRC screening background. The questionnaire included background questions about demographic data, whether the participant had ever discussed CRC screening with a doctor (yes = 1, no = 0), and CRC familiarity (i.e., having had CRC cases in one's family; yes = 1, no = 0). In a single item, we asked participants whether they had ever provided a completed FOBT to attend CRC screening. The answer "no" was coded as 0, "yes" was coded as 1, and "I do not want to answer" was coded as missing.

Hypothetical medical help-seeking. We asked participants to imagine a scenario in which they had been feeling ill for five days with diarrhea and stomach pain (5,7), and had to choose whether to schedule an appointment with a doctor, knowing that doing so would imply the collection of a fecal sample. The choice was between calling the doctor immediately ("0") or waiting a few days in hopes of feeling better ("1"). Regardless of the

participant's answer, a warning reminded participants that they should be screened even in the absence of any symptoms.

Data analyses

To test the controversial multidimensionality of the scale, we ran a CFA with all EBBS items loading on a single factor (14) and a CFA with the expected three-factor model (5). We evaluated the two models' goodness of fit with several indexes: Bollen's incremental fit index (*IFI*, 19), comparative fit index (*CFI,* 20), and the root mean square error of approximation (*RMSEA,* 21). We accepted as satisfactory *IFI*s and *CFI*s higher than 0.90 (22), and we accepted as fair an *RMSEA* between 0.05 and 0.08 (23). To test the internal consistency of the two competitive models, we used Cronbach's alpha coefficients and the correlation among CFA latent variables. We first assessed predictive validity through the correlation test among CFA latent variables (i.e., the subscale of disgust, fear, and embarrassment) and the two outcomes (i.e., self-reported past CRC screening attendance and the intention to delay medical help-seeking). Next, we ran logistic regression analyses for each dependent variable. In each model, we replicated Reynolds et al.'s (5) analyses: We included the emotion subscales and age, gender, CRC familiarity, having ever discussed CRC screening with a medical doctor, risk perception, and screening knowledge as control variables.

Results

The EBBS multidimensional model showed acceptable goodness of fit indexes (*IFI* = 0.94, *CFI* = 0.94, *RMSEA* = 0.08; 90% CI: [0.06–0.10]), while the unidimensional model did not (*IFI* = 0.75, *CFI* = 0.74, *RMSEA* = 0.16; 90% CI: [0.14–0.18]) (Figure 1). The reduced EBBS scale had good internal reliability (α = .81), and its subscales showed acceptable values (Cronbach's alphas: disgust, α = .80; fear, α = .73; embarrassment, α = .67).

<< Figure 1 >>

The three subscales' internal consistency was also supported by correlational analyses, as the three CFA latent variables were positively correlated with one another. In particular, disgust and embarrassment were strongly positively correlated ($r_s = .83$), likely because they share the same elicitor (i.e., contact with fecal matter) and are both associated with the screening procedure. In support of the subscale's predictive validity, the three emotions were negatively correlated with past screening attendance (thus confirming H1–H3) and positively correlated with the decision to delay seeking medical help (thus confirming H4–H6). Correlations between variables are reported in Table 2.

<< Table 2 >>

To test the predictive validity of the EBBS scale, we also conducted a logistic regression for each outcome (Table 3). The model predicting past screening attendance showed an acceptable fit index (χ^2 (9) = 123.75, $p < .001$) and explained 52% of the outcome variance (Nagelkerke's R^2). Older age, having discussed CRC screenings with a doctor, and better screening knowledge predicted greater likelihood of having ever attended a FOBT, whereas fear predicted lower likelihood of the same. Embarrassment, disgust, gender, risk perception, and CRC familiarity were not significant outcome predictors. Hence, our findings supported H9 but not H7 or H8. The model predicting medical help-seeking did not attain statistical significance (χ^2 (9) = 13.11, $p = .158$). As fear was the only significant predictor, we replicated the regression analysis entering only this emotion as the independent variable following Reynolds et al.'s (5) step-wise procedure. The resulting model was significant (χ^2 (1) = 10.47, $p = .001$). More intense fear ($\beta = 1.77$, $p = .001$) predicted greater likelihood of delaying medical help-seeking. The model explained 8% of the outcome variance (Nagelkerke's R^2). Again, only the hypothesis

regarding fear was corroborated (H12), as the findings did not support our expectations about disgust (H10) or embarrassment (H11).

<<Table 3>>

Discussion

The first purpose of this study was to conduct a formal test of the unidimensional (14) versus multidimensional (5) EBBS models. Our findings showed that the fit indexes were acceptable only for the multidimensional model. Therefore, the EBBS scale is suitable for testing the effects of each measured emotion but should not be used as a single score of emotional barriers perception. The second aim of this study was to propose a reduced version of the EBBS scale (5) for contexts in which colonoscopy is not part of CRC screening programs. In Italy, for instance, only 5% of FOBT attendees receive positive results and must then undertake an endoscopic exam (24). This reduced tool might help avoid an unnecessary emphasis on colonoscopy in empirical studies about emotional barriers to CRC screening. Our findings showed that the EBBS scale remains an effective psychometric instrument even without the insertion disgust items.

We obtained overall good internal consistency, and most of our hypotheses about the scale's predictive validity were confirmed. The analyses of the EBBS scale's predictive validity also enabled us to investigate fecal disgust, embarrassment, and fear as predictors of CRC screening avoidance (i.e., the third purpose of this study). In line with our hypotheses, the analyzed emotions (i.e., fecal disgust, embarrassment, and fear) were negatively correlated with the likelihood of having undergone CRC screening through a FOBT and positively correlated with the intention to delay seeking medical help when feeling unwell. However, our regression analyses revealed that, once covariates were introduced, fear of CRC diagnosis was the only

discriminating emotion in predicting the two outcomes. The effects of the covariates seem to be mainly attributable to age and having ever discussed CRC screening with a doctor, as they appear to be the main confounders of the relationship between the emotional barriers associated with CRC screening procedure and past attendance. Indeed, age and having ever discussed CRC screening with a doctor were both correlated with disgust and embarrassment (but not fear), and were significant predictors of screening outcome. The unexpected finding regarding emotions and the two outcomes may be also due to the different elicitors of these barriers. Our participants felt more threatened by a possible cancer diagnosis (i.e., fear, which had the highest mean scores of the three emotions) than by the screening procedure (i.e., disgust and embarrassment).

Clinical Implications

Apparently, for our participants, fear of screening outcome may hinder preventive behaviors such as attending screenings or contacting a health care specialist when feeling sick. Hence, a preliminary implication of the present study might be that screening campaigns should attempt to reassure people, perhaps with the help or mediation of a general practitioner. For our participants, having discussed CRC screening with a practitioner was associated with a greater likelihood of having ever attended an FOBT. In line with previous research (e.g., 25,26), we suggest that an intervention by a health care specialist might be particularly effective in enhancing participants' CRC screening intentions.

Study Limitations

We acknowledge that our work suffers from several limitations, and its findings should be interpreted with caution. First, our study was conducted on a convenience sample and with a retrospective design. A convenience sample recruited on social media platforms might differ from the target population as a whole and may overrepresent people with high socioeconomic

status or educational attainment (27). A retrospective design cannot establish cause–effect relationships and can be affected by recall bias. For instance, analyzing emotional barriers as predictors of past screening attendance means measuring mental representations of those emotions, which might include reflections about social norms and social desirability (28). This is particularly relevant for disgust and embarrassment, which are associated with the screening procedure. Fear of the screening outcome, on the other hand, is salient even in a moment unrelated to the screening exam itself, which can also explain why we had different findings for these emotions. In addition, we found that more intense negative emotions were associated with lower likelihood of having ever attended a FOBT, but it is also possible that having attended a screening in the past reduced the emotional barriers associated with screening, as anticipated negative affects are usually worse than actual experienced emotions (29). Another limitation is that we did not measure any behavior: We adopted self-report measures of screening attendance, which can be inaccurate (30). Finally, we did not directly test whether insertion disgust items increased colonoscopy salience, but we believe that adapting a psychometric instrument to the specific research context is of utmost importance. We recognize that the decision to complete a FOBT is not unrelated to the possibility of undergoing colonoscopy. However, we suggest measuring insertion disgust with less items.

The limitations of the present study could be overcome in further studies: a prospective design might test the differences in the performance of the original versus reduced EBBS scales, and it could analyze emotional barriers as predictors of intention or future screening attendance. As already noted by Reynolds et al. (5), further studies are needed to disentangle the cause-and-effect relationship between emotions and screening behavior. Future research should also strive to reach a representative sample and in particular to include people distant from institutions and

the healthcare system, as well as those with a low socioeconomic status. Indeed, these characteristics could affect the perception of CRC screening (e.g., 31) and yield the most interesting insights for comparative research and application purposes.

Conclusions

Studying how negative emotions induce avoidance for screening tests like the FOBT is the first step in designing interventions to promote these preventive behaviors. The EBBS scale (5,13) was developed for this purpose, as it measures different emotions related to CRC screening. In line with Reynolds et al. (5), the authors of the original EBBS scale, in the present study we suggest using the EBBS scale as a multidimensional instrument. We tested a reduced version of the EBBS scale that did not contain the insertion disgust subscale, which was incoherent with the Italian CRC screening program. The internal consistency tests showed that the reduced EBBS scale had acceptable reliability. In future studies of this topic, researchers can thus choose between the two versions of the EBBS scale based on their purposes and samples. Finally, to the best of our knowledge, this is the first study to investigate affective associations of disgust, embarrassment, and fear related to CRC screenings in an Italian context. We found that our participants were less likely to attend screening when they were more worried about future exam outcomes. We believe that, for our sample, campaigns and interventions with reassuring messages would be beneficial, although this should be further tested.

Disclosure and Ethical Statement

The authors report no conflict of interest and certify the compliance with APA ethical principles regarding research with human participants in the conduct of this study. According to the 1964 Declaration of Helsinki, before taking part in the study we informed participants about any relevant aspect of the study. They were informed of the right to refuse to participate in the study or to withdraw consent to participate at any time during the study without reprisal. They

then confirmed that they understood the instructions correctly, accepted to participate, and started filling out the questionnaire. The present work does not imply any intervention and, as it is not a medical study, we did not search approval by a Research Ethical Committee.

Data Availability Statement

The data supporting our findings are available in Open Science Framework (32).

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Figure legends

Figure 1. On the top: Confirmatory Factor Analysis of the multidimensional EBBS scale (standardized parameters and correlations between the three emotional dimensions are displayed). On the bottom: Confirmatory Factor Analysis of the unidimensional EBBS scale (standardized parameters are displayed).

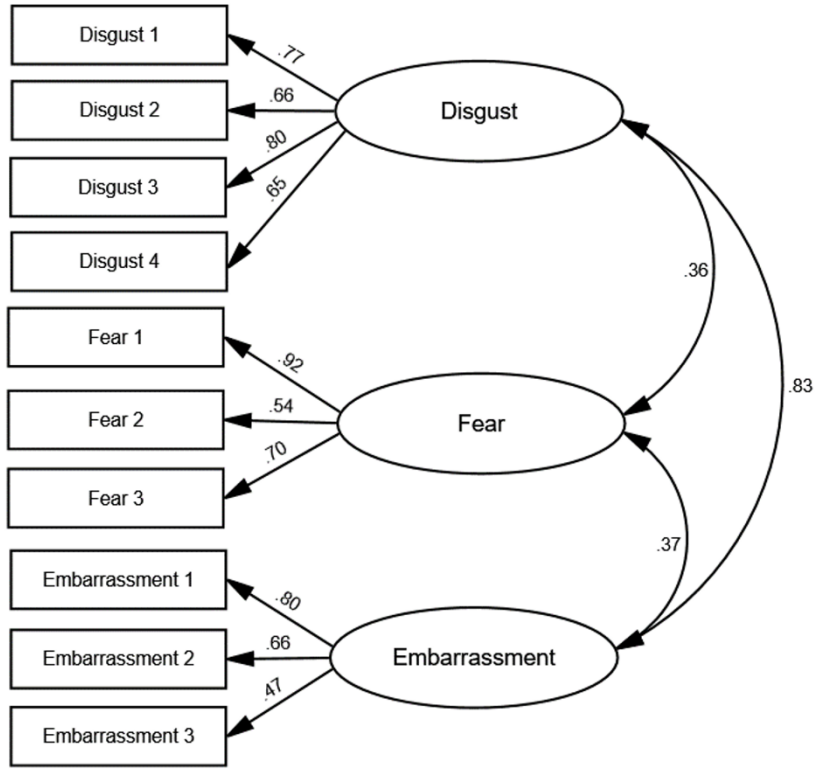
Table legends

Table 1: Participants' characteristics.

Table 2: Correlations between variables.

Table 3: Logistic regressions

Figure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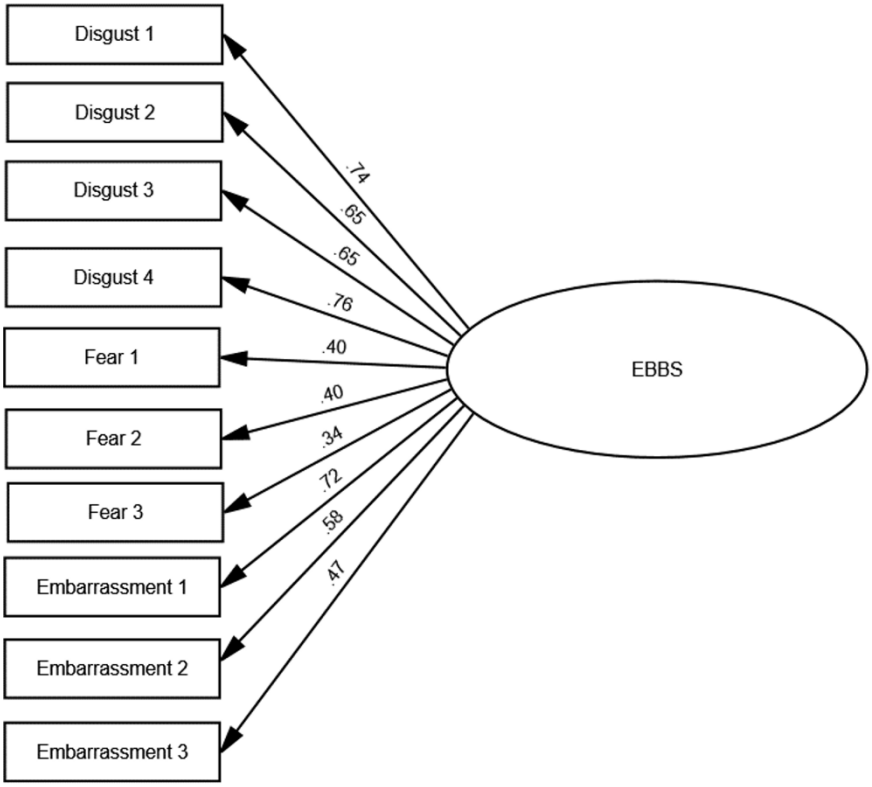
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Figure 1. On the top: Confirmatory Factor Analysis of the multidimensional EBBS scale (standardized parameters and correlations between the three emotional dimensions are displayed). On the bottom: Confirmatory Factor Analysis of the unidimensional EBBS scale (standardized parameters are displayed).

Tables

Table 1: Participants' characteristics

	***M* (*SD*)**	***N* (%)**
Age	54.78 (5.95)	
Gender		
Male		47 (18%)
Female		211 (82%)
CRC risk perception		
Lower than others		18 (7%)
About the same as others		199 (77%)
Higher than others		40 (16%)
Ever discussed CRC† screening with a doctor		85 (33%)
CRC familiarity‡		63 (25%)
Ever attended CRC screening		149 (58%)
CRC screening knowledge	6.40 (1.42)	
EBBS§ disgust subscale	5.40 (2.73)	
EBBS embarrassment subscale	3.86, (1.82)	
EBBS fear subscale	5.71 (3.11)	

Notes: †Colorectal cancer, ‡Number of participants who reported cases of colorectal cancer in their family, §Emotional Barriers to Bowel Screening

Table 2: Correlations between variables

	Age	Gender	CRC† risk perception	Ever discussed CRC screening with a doctor	CRC familiarity	CRC screening knowledge	EBBS disgust subscale	EBBS fear subscale	EBBS embarras-sment subscale
Gender	–0.01								
CRC risk perception	–0.032	–0.069							
Ever discussed CRC screening with a doctor	.182*	.115	.240**						
CRC familiarity	0.104	.055	.266**	.196*					
CRC screening knowledge	.193*	.103	.107	.202*	.122				
EBBS disgust subscale	–0.193*	–0.038	–0.028	–.188*	–0.006	–0.093			
EBBS fear subscale	–0.022	0.034	–0.016	–0.119	–0.026	–0.041	.365**		
EBBS embarrassment subscale	–0.174*	0.033	–0.078	–.186*	0.032	–0.025	.834**	.376**	
Past CRC Screening Attendance	.489**	0.08	0.054	.376**	0.087	.349**	–.146*	–.155*	–.190*
Delay seeking medical help	.048	–0.066	–0.033	–0.056	0.074	–.015	.146*	.223**	.172*

Notes: † Colorectal Cancer, *p ≤ .05, **p ≤ .001. Model fit indexes: *IFI* = 0.94, *CFI* = 0.94, *RMSEA* = 0.07 (90% CI: 0.05–0.09)

Table 3: Logistic regressions

	CRC† screening past attendance				Delay seeking medical help			
	OR	*p*	β	95% C.I.for β	OR	*p*	β	95% C.I.for β
Age	1.25	.000	3.75	(2.43, 5.78)	1.01	.865	1.04	(0.69, 1.57)
Gender	1.94	.127	1.29	(0.93, 1.8)	0.71	.509	0.88	(0.59, 1.3)
CRC risk perception	0.92	.836	0.96	(0.66, 1.4)	0.77	.573	0.88	(0.58, 1.36)
Ever discussed CRC screening with a doctor	5.42	.000	2.22	(1.51, 3.26)	0.77	.606	0.88	(0.55, 1.41)
CRC familiarity	0.73	.471	0.88	(0.61, 1.26)	1.73	.248	1.27	(0.85, 1.89)
CRC and CRC screening knowledge	1.66	.000	2.06	(1.38, 3.08)	0.94	.667	0.91	(0.6, 1.38)
EBBS‡ disgust subscale	1.11	.171	1.34	(0.88, 2.03)	1.04	.610	1.12	(0.72, 1.76)
EBBS embarrassment subscale	0.85	.239	0.75	(0.46, 1.21)	1.06	.621	1.12	(0.72, 1.72)
EBBS fear subscale	0.87	.022	0.66	(0.46, 0.94)	1.16	.019	1.60	(1.08, 2.35)

Notes. † Colorectal cancer, ‡ Emotional Barriers to Bowel Screening