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Disgusted, embarrassed, annoyed: Affective associations relate to uptake of colonoscopy screening

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Abstract

BACKGROUND—Uptake of colorectal cancer screening is lower than desired. Screening decision making research has traditionally focused on benefits and barriers to screening. This study examines the relation of affective associations with screening (feelings and emotions associated with screening) to colonoscopy screening uptake.

METHODS—Participants were 103 African American community adults. Participants completed a structured interview assessing perceived benefits of and barriers to colonoscopy screening, affective associations with colonoscopy, colonoscopy screening behavior, and intentions for future screening.

RESULTS—Higher positive and lower negative affective associations with screening were both significant predictors of colonoscopy uptake. Affective associations fully mediated the relation of perceived benefits and barriers to screening uptake. Affective associations were associated with intentions for future screening.

CONCLUSIONS—Incorporation of affective associations into models of screening decision making and intervention approaches to address screening compliance has utility for advancing our understanding of screening adherence as well as increasing screening rates.

Keywords

Affective associations; Health decision making; Colonoscopy

Colorectal cancer is a significant contributor to morbidity and mortality in the United States, with about 150,000 new cases and 50,000 deaths each year (1, 2). Screening for colorectal cancer is a cost-effective prevention and control strategy (3); screening leads to earlier

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Conflict of Interest

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detection, which is associated with higher survival rates (4–9). Unfortunately, only about 1/3 of colorectal cancers are diagnosed at an early stage (10, 11). This is primarily due to low rates of screening compliance -- only about 1/2 of adults in the United States are compliant with recommendations for colorectal cancer screening (12, 13).

Although screening behavior is impacted by a number of broader environmental and systems factors (14, 15), at its heart screening involves a decision on the part of the individual to engage in (or not engage in) a screening test. Traditional approaches to examining decision making concerning colorectal cancer screening have focused primarily on perceptions of the expected utility of screening based on relative perceptions of benefits and barriers to screening (16, 17). These approaches have shown that such expected utility beliefs predict screening behavior (18–22). However, expected utility only accounts for a portion of the variance in behavior (23–25), suggesting that other decision making constructs might also impact engagement in screening.

In addition to expected utility and other cognitive constructs, behavior is influenced by affective associations; feeling states or specific emotions associated with a behavior (26–28). For colorectal cancer screening, relatively little work has addressed affective associations. Some studies have shown that embarrassment about procedures is noted and associated with noncompliance (29, 30). Fear of pain and test results and anxiety about screening procedures are barriers in those noncompliant with screening (31). Finally, qualitative work has shown that disgust about stool is a barrier to fecal occult blood testing (32).

To date, studies of affective associations and colorectal cancer screening have taken a very piecemeal approach, examining only one type of affect (e.g., fear or disgust) at a time. In addition, most work has only examined main effect relations of affect to behavior; the interplay of affective associations with expected utility beliefs has not been examined. In this paper, we examine two key questions about the role of affective associations in screening engagement. First, we examine whether affective associations differentiate screened from unscreened individuals. Second, we explore whether affective associations account for variance over and above expected utility beliefs and, if so, how affective associations and expected utility beliefs jointly work to influence behavioral engagement.

We focus on colonoscopy for two reasons. First, colonoscopy is the most widely used test in the United States (10, 33) and the most frequently recommended by clinicians (34). Second, although other tests are included in screening recommendations, a recent analysis of the relative effectiveness of each test concluded that only fecal occult blood testing and colonoscopy have sufficient detection sensitivity to be used alone; flexible sigmoidoscopy must be supplemented with interval fecal occult blood testing to be effective (35).

Methods

Participants

103 community adults from the New York City (N=55) and Buffalo NY (N=48) metropolitan areas were recruited to participate. Several recruiting strategies were used at

both sites: 1) community-based organizations were approached and asked permission to recruit participants on their sites; 2) participants were recruited from the social network of community members involved in work with the authors' institutions; and 3) past participants of health education programs were recruited. In addition, in New York City we handed out flyers in our primary care clinic, which has a high proportion of African American patients, inviting them to participate. In Buffalo, participants were also recruited from cancer center nutrition services and environmental workers. We selected this recruiting strategy given that it mirrors that used for recruiting participants to educational programming concerning colorectal cancer screening at the authors' institutions.

The study was conducted as a part of preliminary work for development of intervention programming for African American adults concerning colorectal cancer screening. Given that, inclusion criteria for recruitment were age 50 or older (given recommended ages for starting screening) and self-identification as Black/African American (given the role of the study in intervention programming development for African Americans). Recruiting was stratified such that approximately 1/2 of participants were compliant for colonoscopy screening and approximately 1/2 were non-compliant. Inclusion criteria were assessed at the beginning of the interview.

Procedure

All procedures were approved by the institutional review boards at each study site. Interviews were conducted over a 4-week period in Fall 2012. Community members who agreed to participate in the survey and completed informed consent took part in a brief (20 minutes) structured interview conducted by a trained interviewer (98 of the interviews were in person; the remaining 5 were by telephone). Participants were asked questions about familiarity with, thoughts and feelings about, and engagement in colonoscopy screening, in addition to beliefs about benefits and barriers to colorectal cancer screening and demographic characteristics. All responses were given verbally and were recorded by the trained interviewer. Participants received a store gift card as a thank you for participating.

Measures

Measures included affective associations with colonoscopy, perceived benefits and barriers to colonoscopy screening, past screening behavior, intentions to be screened in the future, and demographics. For all measures drawn directly from published measures, response scales were those recommended by the measure authors. For scales modified for the study, response scales were ones used successfully in previous studies using the measure.

Affective Associations—Affective associations were assessed with 10 items modified from a standard measure of affective attitude components (36). Participants were asked the question “When you consider having a colonoscopy, how do you feel?” They then responded to each of 10 affect items (Positive affect: happy, satisfied, relaxed; Negative affect: disgusted, tense, angry, annoyed, sad, embarrassed, afraid) using an 8-point scale with endpoints of 1=Not [Happy] and 8=Extremely [Happy]. Both scales had strong reliability: positive $\alpha=0.85$; negative $\alpha=0.86$. In addition, we calculated an overall affective associations score by reverse coding the positive affect items (such that higher numbers

indicate more negative associations) and taking the mean of all 10 items; this scale also had strong reliability: overall affective associations $\alpha=0.90$.

Perceived Benefits and Barriers—Participants completed a modified version of Rawl and colleagues (37) screening benefits/barriers measure; two items were removed from the measure because their content overlapped with the affective associations measure (items assessing worry about cancer and embarrassment about screening). Participants indicated the extent to which they agreed with four potential benefits (e.g., “Finding colorectal cancer early will save your life”) and five potential barriers (e.g., “The cost would keep you from having a screening test”). Participants responded using a 5-point scale with endpoints of 1=Strongly Disagree and 5=Strongly Agree. Responses to the benefits items and barriers items, respectively, were averaged to create summary measures of perceived benefits and barriers (benefits $\alpha=0.89$; barriers $\alpha=0.76$).

Screening Behavior—Participants were asked if they had ever completed a colonoscopy test. Those responding yes were then asked when they did their most recent test and why they did the test (routine examination or other reasons). The time of most recent test item had a set of response options such that compliance to recommendations could be examined; response options included “More than 5 years ago, but not more than 10 years ago” and “More than 10 years ago”, with compliance coded as a response less than “More than 10 years ago”. However, the ever screened and compliant with screening variables were identical for all but two participants (both of whom had been screened more than 10 years ago); therefore, ever screened was used as the outcome variable in all analyses. Participants indicating a screening test for other than routine reasons ($N=7$) were excluded from analyses.

Screening Intentions—Participants were asked how likely they were to have a colonoscopy in the next 12 months. Participants responded using a 7 point scale with 1=not likely at all to 7=extremely likely.

Demographics—Participants reported age, gender, health insurance status, education, income, and health care provider status.

Analysis Strategy

The first research question, whether affective associations with screening relate to screening uptake, was examined by estimating logistic regression models with colonoscopy screening uptake (unscreened, screened) as a dichotomous outcome variable and affective associations as the continuous predictor variable. Given the relation of age to screening uptake (see *Participant Demographics* below), age was included as a continuous covariate in analyses. Similarly, logistic regression equations were estimated with perceived benefits and barriers as continuous predictor variables.

To examine potential interrelations of benefits/barriers and affective associations as influences on behavior, both mediated and moderated models were estimated. Mediation models were estimated using bootstrap sampling for modeling the indirect effect of benefits [barriers] on screening with affective associations modeled as a mediator. This bootstrap

estimation was done using the *PROCESS* macro (38) in SPSS v. 20. Moderation models were estimated by including the main effects and interaction term in a logistic regression model with behavior as a categorical outcome variable.

To examine the practical significance of the relation between affective associations and screening, a predictive margins analysis (39) was conducted to estimate the proportion of individuals that would be screened at each level of the affective association variable. This technique uses the estimated logistic regression equation to estimate the predicted value of an outcome variable (in our case, proportion screened) at a given level of a predictor variable (e.g., a score of 3 on the affective associations measure), with all covariates included in the regression equation held constant. We included age, perceived benefits, and perceived barriers as covariates in the predictive margins analysis so as to estimate the impact of affective associations on screening over and above these other known influences.

Finally, to examine the relation of benefits/barriers and affective associations to screening intentions, we first estimated a series of linear regression models with intentions as a continuous outcome variable and benefits, barriers, and affective associations as predictor variables (in separate models).

Results

Participant Demographics

Participant demographics are reported in Table 1. Participants at the New York City site were older ($t(101)=3.36, p<.001$), had lower income ($\chi^2(7)=15.56, p<.05$), and were more likely to be unemployed ($\chi^2(1)=10.07, p<.01$) relative to Western New York participants. There were no other differences by site. We examined the relation of demographic characteristics to colonoscopy uptake. Age was the only demographic variable significantly related to uptake, with older participants more likely to be screened; $OR=1.11$ (95% CI 1.05–1.18).

Relation of Affective Associations to Screening Behavior

Table 2 reports the relation of affective associations to colonoscopy uptake. As can be seen in the table, having more positive affective associations with colonoscopy was related to an increased likelihood of uptake. By contrast, having more negative affective associations was related to a decreased likelihood of uptake.

Table 2 also reports the relation of each individual affective associations item to colonoscopy uptake. All three of the positive affect items significantly predicted screening behavior; in every case, higher levels of positive affect associated with screening were related to increased colonoscopy screening behavior. For five of the seven negative affect items, significant relations with screening behavior were found; higher levels of negative affect were related to lower engagement in screening behavior. Notably, the effect was in the same direction for the remaining two negative affect items, although the relation was not statistically significant.

Relation of Perceived Benefits and Perceived Barriers to Behavior

The relation of perceived benefits and of perceived barriers to colonoscopy screening behavior was also examined. Increasing perceived benefits were significantly associated with greater engagement in colonoscopy; $OR=1.78$ (95% CI = 1.07, 2.96). By contrast, increasing perceived barriers were significantly associated with lower engagement in colonoscopy; $OR=0.42$ (95% CI = 0.25, 0.72).

Interplay of Benefits/Barriers and Affective Associations: Mediated Relations

Bootstrapping estimation of the relation between perceived benefits and colonoscopy screening with affective associations as a mediator revealed a significant mediated relation; indirect effect = 0.22 (95% CI = 0.057, 0.51). When affective associations were modeled as a mediator, there was no direct effect of benefits on behavior, suggesting full mediation; direct effect = 0.36, $z=1.40$, *ns*. Similarly, the relation of perceived barriers to colonoscopy screening was fully mediated by affective associations; indirect effect = -0.30 (95% CI = -0.67 , -0.057), direct effect = -0.56 , $z=1.94$, *ns*.

Interplay of Benefits/Barriers and Affective Associations: Moderated Relations

Affective associations did not moderate the relation between either benefits or barriers and colonoscopy screening behavior; benefits interaction $b = 0.12$, $z < 1$, *ns*; barriers interaction $b = -0.26$, $z = -1.50$, *ns*.

Predictive Margins Analysis

The full set of predictive margins estimates is presented in Table 3. As can be seen in the table, estimated colonoscopy screening rates declined with each stepwise increase in (negative) affective associations. Overall, individuals with the most positive affective associations are estimated to have a 69% colonoscopy screening uptake rate, whereas those with the most negative affective associations are estimated to have a 26% uptake rate.

Relation of Affective Associations and Behavioral Intentions

For those participants who had not been screened, affective associations were related to screening intentions. Controlling for age, as affective associations became more negative, screening intentions decreased, $\beta=-0.30$, $t(40)=-2.03$, $p<.05$. By contrast, neither perceived benefits nor perceived barriers predicted screening intentions; benefits $\beta=0.22$, $t(40)=-1.37$, *ns*; barriers, $\beta=-0.26$, $t(40)=-1.71$, *ns*.

Discussion

Affective associations with colonoscopy screening, both at the global level of positive and negative affect and at the level of specific positive and negative emotions, were significantly associated with uptake of screening behavior. Relative to those unscreened by colonoscopy, those screened had significantly higher positive and significantly lower negative affective associations with screening behavior. Importantly, this was true even after accounting for perceptions of the relative benefits of and barriers to screening.

In addition, analyses examining the nature of interrelations of benefits, barriers, and affective associations showed that affective associations mediated the relation of perceived benefits and perceived barriers. In both cases, the relation of expected utility beliefs and behaviors was fully mediated by affective associations with the behavior.

Predictive margins analyses suggested that having negative versus positive associations with screening behavior could lead to a substantial difference in screening compliance. Having the most negative affective associations was predicted to lead to a screening rate of only 26%, whereas the least negative (most positive) associations were predicted to lead to a screening rate of almost 70%.

Implications for Understanding Screening Decision Making

Collectively, these findings suggest that affective associations with colonoscopy screening may play a central role in whether individuals engage in screening behavior. Because most studies of decision making concerning colorectal cancer screening focus on cognitively-based constructs such as perceived benefits and perceived barriers (16, 17), these findings extend our understanding of decision making factors which impact screening uptake.

Because most previous examinations of affective associations and screening have been piecemeal, looking at only one or a small number of affective states and have not examined the interplay of affective associations and cognitive beliefs, the work presented here increases our understanding of how decision making concerning cancer screening takes place and adds to our knowledge of important factors involved in screening decision making. The results clearly demonstrate that affective associations are importantly involved in decision making over and above cognitions and need to be considered systematically in our understanding of screening decision making.

Finally, the specific nature of colorectal cancer screening raises an additional decision making implication. Because there are multiple screening modalities for colorectal cancer, the decision making process does not only involve making a “do” or “don’t do” decision concerning colonoscopy but can potentially involve making a decision between multiple possible ways of engaging in screening behavior. The results presented here indicate that even when focusing only on a single screening modality, affective associations predict behavior. In addition to this effect, it would be plausible to assume that when selecting amongst multiple behavioral options, decision making might also be influenced by the relative positivity or negativity of affective associations of alternative behavioral choices. Thus, in these multiple option situations, decision making models might be expanded to consider how affective associations with each of the multiple behavioral options are compared and integrated during the process of decision making.

Implications for Interventions to Increase Screening Uptake

Notably, most intervention approaches to addressing health behavior change, including interventions to address decision making about cancer screening overall, take as their starting point an educational approach to addressing one or more of the cognitively-based decision making determinants encompassed in expected utility models, such as perceived benefits and perceived barriers (40, 41).

Although these interventions are modestly successful, there is certainly substantial room for improvement. Our work suggests that, given the relative paucity of work addressing affective associations in intervention approaches, intervention approaches targeting affective associations (with an eye towards making associations with screening behaviors less negative or more positive) may have substantial promise as a way of increasing compliance with screening recommendations, especially colonoscopy. Such approaches have been used successfully in other behavioral domains, including safer sexual behavior (42), research participation (43), and physical activity (44). Approaches that target affective associations with screening or which take a dual approach and address both affective and cognitive determinants of decision making may be substantially more effective than approaches which target cognitive components alone.

In addition, the point made above about affective associations with the multiple behavioral options available for colorectal cancer screening raises an additional possible route for interventions. Given the multiple behavioral options, interventions need not be restricted to a single screening modality. In fact, given the effect of affective associations on behavior, it might be fruitful for interventionists to assess an individual's affective associations with different screening modalities and then tailor interventions approaches to focus on the modality with the most positive affective associations. For example, if a person had very negative associations with colonoscopy screening but less negative/more positive associations with fecal immunochemical testing, an intervention might encourage that person to seek out the fecal immunochemical test, whereas a person with the opposite pattern of affective associations might be encouraged to seek out a colonoscopy. Such tailoring by affective associations might increase the likelihood of an intervention successfully leading to screening behavior.

Limitations

There are, of course, limitations to the work presented here that need to be considered. First, it is important to acknowledge that the study design is cross-sectional and observational. Therefore, the findings need to be interpreted as relations between affective associations and screening uptake rather than evidence for causal effects. Although there have been demonstrations of causal relations between affective associations and screening behavior (28) which would suggest that there may well be causal relations, the current work cannot directly support causal inferences. It is possible that the experience of having a colonoscopy might shift one's affective associations; to the extent that the procedure was less aversive than initially expected, this might lead to more positive associations. Future research should examine this possibility; to the extent that there is an association, it might be possible to design intervention strategies in which screened individuals communicate to unscreened individuals about the differences between their expectations and the actual procedure.

In addition, categorization of individuals into screened versus unscreened were based on self-reported screening behavior. Although self-report measures do have limitations, examinations of the utility of self-report measures of colorectal cancer screening behavior have typically shown high concordance with objective screening measures (45).

Also, it is important to note that only African American individuals from a relatively restricted socioeconomic strata were surveyed. Whether affective processes such as affective associations would differ as a function of race/ethnicity is an open question. There is work which would suggest that affective processes might be influenced by race/ethnicity (46, 47) and culture (48, 49). Additional work examining affective associations and screening behavior with a broader race/ethnic population would be useful to determine the generalizability of the effects.

Finally, one should note that we only examined decision making for one modality for colorectal cancer screening, colonoscopy. Colonoscopy is by a large margin the most commonly used screening test in the United States (12, 50). In addition to colonoscopy, the survey also included questions about the fecal immunochemical test. Fecal immunochemical testing and colonoscopy were selected because they are the two modalities provided for low income/uninsured individuals under the New York State Cancer Services Program (51, 52). However, analysis of the descriptive behavioral data revealed that only a very small number of participants were currently compliant with fecal immunochemical test testing (N=9), and that the majority of those participants were also compliant with colonoscopy (only three participants were compliant with fecal immunochemical test but not colonoscopy). Given the very disproportionate nature of the data, it was not feasible to test decision making predictors of fecal immunochemical test screening. By contrast, given the recruitment design, there were relatively equivalent proportions of colonoscopy screened versus unscreened individuals. It would be valuable in future work to examine whether the relation of affective associations to screening behavior is consistent across different screening modalities.

Conclusions

Affective associations with screening are strongly associated with colonoscopy uptake. Moreover, the route through which benefits and barriers relate to screening behavior is indirect and mediated by affective associations. Given the substantial estimated difference in screening uptake for those with the most positive versus the most negative affective associations, incorporation of affective associations into models of screening decision making and into intervention approaches to address screening compliance has utility for advancing our understanding of screening adherence.

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Table 1

Characteristics of the Sample (N=103)

Demographic	Variable Percentage of Sample
Age	
50–59	38%
60–69	44%
70–79	14%
80+	4%
Gender	
Male	45%
Female	55%
Education Level	
Less than High School Graduate	23%
High School Graduate	32%
Some College	25%
Bachelor's Degree or Higher	19%
Income Level	
<\$10,000	25%
\$10,000 – \$19,999	25%
\$20,000 – \$29,999	18%
\$30,000 – \$39,999	12%
\$40,000	18%
Insurance Status	
Uninsured	8%
Insured	92%
Have a Health Care Provider	
No	13%
Yes	87%
Employment Status	
Currently Unemployed	62%
Currently Employed	38%
Recruitment Site	
New York City	53%
Buffalo	46%

Table 2

Relation between affective associations, expected utility beliefs, and colonoscopy uptake; controlling for participant age.

Predictor Variable	Odds of Colonoscopy Uptake (reference group= not screened) OR (95% CI)
Global Affective Associations	
Positive Affective Associations	1.30 (1.07, 1.57)**
Negative Affective Associations	0.69 (0.55, 0.88)**
Overall Affective Associations (higher numbers=more negative)	0.65 (0.51, 0.84)***
Individual Affective Items	
Happy	1.18 (1.01, 1.39)*
Satisfied	1.37 (1.12, 1.68)**
Relaxed	1.19 (1.01, 1.40)*
Tense	0.85 (0.73, 1.003) ⁺
Angry	0.70 (0.55, 0.89)**
Annoyed	0.79 (0.68, 0.95)**
Sad	0.81 (0.66, 0.99)*
Embarrassed	0.83 (0.71, .97)*
Afraid	0.88 (0.75, 1.04)
Disgusted	0.79 (0.66, 0.95)**
Expected Utility Beliefs	
Perceived Benefits	1.78 (1.07, 2.96)*
Perceived Barriers	0.42 (0.25, 0.72)***

⁺ $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 3

Predictive Margins Analysis

Affective Associations with Screening	Ever Colonoscopy
1 (least negative)	69%
2	64%
3	57%
4	51%
5	44%
6	38%
7	32%
8 (most negative)	26%

Note: predictive margins estimates reported here controlled for age, perceived benefits, and perceived barriers.