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Perceived Functional Limitation and Health Promotion during Mid- to Late Life: The Mediating Role of Affect

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Engagement in health-promoting behaviors plays an important role in successful aging and may delay the onset and progression of disability in later life. The current study examined a model of health promotion using age, perceived functional limitation, and affective beliefs (e.g., positive affect and negative affect) as predictors of health-responsibility behaviors. Participants were 122 adults between the ages of 40 and 88 who completed measures via an online survey. Results indicate that perceived functional limitation both directly and indirectly, through its association with positive affect, influence health-responsibility behaviors. Adults who perceived more severe functional limitations and experienced greater positive affect reported engagement in more health-responsibility behaviors. This finding suggests that positive affect may be an underlying mechanism by which functional limitation influences engagement in health-promoting behaviors. These results may also have important clinical implications for the use of positive affect as an indicator of health functioning among middle-aged and older adults with chronic illness.

Keywords: aging, affective beliefs, functional limitations, health promotion

Health-promoting behaviors are typically categorized as behaviors that move individuals towards optimal health while concurrently decreasing one's susceptibility to disease and illness (Becker & Arnold, 2004; Breslow, 1999). Health promotion signifies altering one's behavior (e.g., adopting physical activity) to maximize health potential (e.g., improved cardiovascular fitness) while concurrently enhancing capacity for living (e.g., decreased functional disability) (Breslow, 1999; Grzywacz & Keyes, 2004). Research has demonstrated that health behaviors, both risky (e.g., smoking) and promotive (e.g., exercise), are highly predictive of illness, disability, and mortality rates (Grzywacz & Keyes, 2004). Health promotion may be especially important during mid- to late-life, when chronic illnesses or diseases (e.g., high blood pressure, arthritis) which typically accompany the aging process begin to emerge, as they may threaten aging adults' health and well-being.

Research is mixed with respect to identifying the frequency of health-promoting behaviors across age groups. Results appear to depend on the health promotion domain of interest. For example, in the physical activity domain, a large body of research (see Nelson, Rejeski, Blair, Duncan, Judge, King et al., 2007; Prohaska et al., 2006) suggests that engagement in regular physical activity decreases with age, and older adults are more likely to be sedentary when compared to younger and middle-aged. Other research (George, 2001; Leventhal, Rabin, Leventhal, & Burns, 2001; Walker, Volkan, Sechrist, & Pender, 1988; Zanjani, Schaie, & Willis, 2006) suggests that older adults are more likely to engage in health-promoting behaviors than middle-aged adults because death and morbidity are salient issues for older adults, which are motivators for behavior change and engagement in health promotion. Furthermore, research by Zanjani, Schaie, and Willis (2006) indicates that health behavior change varies by health domain (e.g., food consumption, seeking medical care) and adults' health status (e.g., cardiovascular disease status versus condition free status). Particularly, adults who were diagnosed with cardiovascular disease were more likely to engage in three specific health promotion domains (e.g., food preparation, food consumption, and medical care) than adults with a condition free status (Zanjani et al., 2006). This behavior change may represent aging adults' awareness of health promotion strategies as a means to reduce the risk of future illness (caused by the either the aging process or co-morbidity) or premature mortality. Thus, health behavior change and engagement in health promotion may be related to adults' current health status, and not necessarily to their age.

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Within the health promotion literature, a majority of research focuses on identifying psychosocial correlates of physical activity and nutrition behaviors. However, Walker, Sechrist, and Pender (1987) assert that health promotion is a multidimensional construct. There is a paucity of research on the health promotion domain of 'health-responsibility.' Health responsibility involves an active sense of accountability for one's own well-being and includes behaviors such as paying attention to one's health status, educating one's self about health, and being an informed consumer when seeking professional health advice and care (Walker & Hill-Polerecky, 1996). With the prevalence of chronic disease and obesity steadily increasing in the United States and many other industrialized countries, there is much debate regarding who is responsible (e.g., consumers, food companies, health care providers) for this increasing trend.

Influence of Chronic Disease

The prevalence rates for many chronic health conditions continue to increase in the United States (Piazza, Charles, & Almeida, 2007); it is estimated that more than 54 million adults are living with some type of chronic condition (e.g., arthritis, heart disease) and 21 million experience daily limitations due to one or more conditions (US Census Bureau, 2008). The current western obesity epidemic (see Swinburn, Egger, & Raza, 1999; World Health Organization, 1998) may be attributable to the increasing prevalence rates of chronic diseases. As a result, it is important to explore how adults' perceived functional impairment, which is a result of their chronic health condition status, influences participation in health promotion. However, limited research has explored how perceived severity of dealing with such conditions interacts with psychological variables to influence participation in health-promoting behaviors.

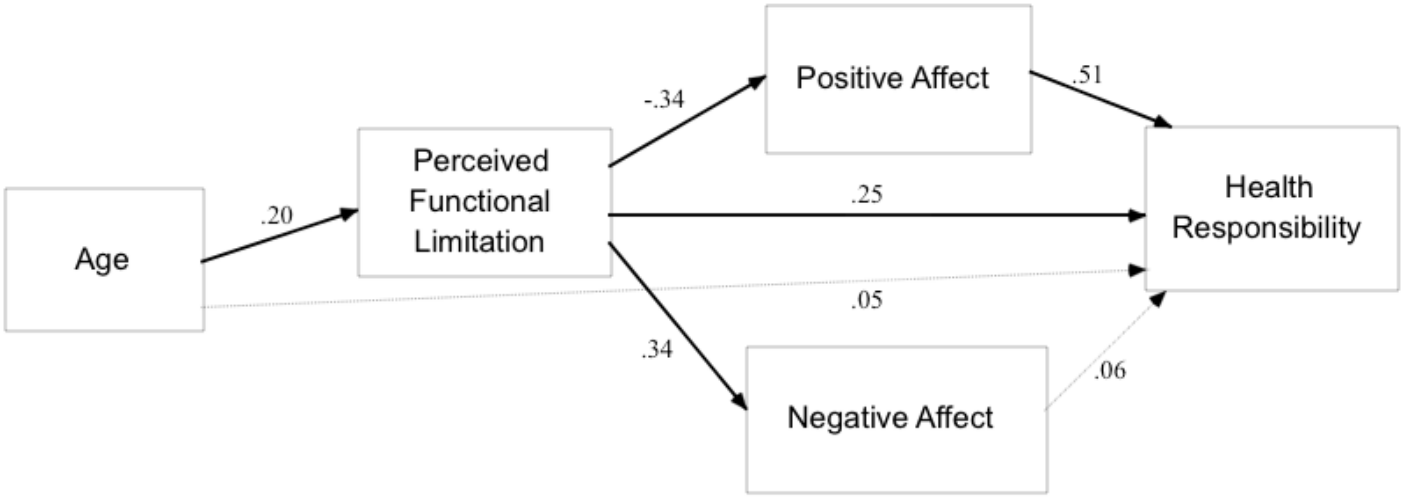
Chronic health conditions are often associated with experiencing functional limitations or limited mobility, which are significant barriers towards participation in health promotion. For example, Rasinado and colleagues (2006) found that adults reported poor health as a major barrier towards exercise; those who experienced limited mobility were less likely to engage in physical activity. Traywick and Schoenberg (2008) likewise assert that having a chronic health condition may decrease the likelihood that adults will participate in health promotion. More specifically, women who had coronary heart disease were less likely to engage in physical activity because their compromised health status significantly decreased their exercise self-efficacy. However, Zanjani et al. (2006) report that having a chronic health condition may provoke adults to engage in a wider variety of health-promoting practices (e.g., participate in physical activity, monitor fat consumption, etc.) because illness is now salient to them, thus making them feel vulnerable to developing future diseases. As a result, being diagnosed with a chronic health condition may motivate adults to change their current health habits and engage in more health promotion.

Researchers typically examine the outcomes of chronic illness (i.e., disability) as measured by activities of daily living (ADL). Perceived functional limitation has received relatively less attention, but is an important construct to consider as it is considered a pathway by which chronic illness leads to disability (Lee and Park, 2006). As such, perceived functional limitation may prove useful in designing health interventions aimed at decreasing future disability.

Mediating Role of Affect

Emotional states have been linked with both mental and physical functioning. Emotional experience is composed of two factors: positive affect and negative affect. Positive affect (PA) is comprised of mood states such as happy, energetic, and interested and reflects one's pleasurable engagement with the environment. In contrast, negative affect (NA) includes a range of aversive mood states including sad, worried, and depressed and reflects one's unpleasurable engagement with the environment (Watson, 1988). Research on the association between emotional states and health indicate that high positive affect and low negative affect are associated with fewer depressive symptoms, higher daily activity, and higher physical and mental quality of life (Hu & Gruber, 2008). Similarly, Kelsey, DeVellis, Begum, Belton, Hooten, and Campbell (2006) found that positive affect was associated with greater self-reported health and well-being, and fewer declines in physical functioning. Alternatively, negative affect was strongly correlated with health complaints across a wide range of health problems (Kelsey et al., 2006). One explanation for this relation is that negative affect is associ-

Figure 1. Tested model.



Note: Standardized regression weights are shown. Bolded paths are significant at the $p < .05$ level.

ated with health problems through its association with anxiety, anger, and tension (Watson, 1988). Conversely, Mayne (1999) suggests that negative affect may promote engagement in health-promoting behaviors. Specifically, negative emotions such as anxiety and depression may lead to preventative health practices and healthcare seeking. In sum, these findings suggest that affect may play a role in both facilitating and hindering health-promoting behaviors.

In older adult samples, positive affect has been linked to better health outcomes and fewer illness symptoms. Older adults who reported experiencing greater positive affect had better self-reported health and less severe symptom reporting (Cohen & Pressman, 2006). Likewise, increased longevity was associated with older adults' positive perceptions of the aging process (Levy, Slafe, Kunkel, & Kasl, 2002). Positive affect has been associated with more resourceful problem solving and better coping (Frederickson & Joiner, 2002) and may serve as a resource that allows adults to effectively deal with the onset of chronic disease, as well as the physical changes that coincide with the aging process. Conversely, negative affect has been associated with decreased focus and attention (Kelsey et al., 2006) and thus limits adults' ability to overcome or defend against a health threat. Accordingly, affect may be a mechanism in which to understand how perceived functional limitations influence engagement in health promotion.

Current Study

Despite the links between functional limitation and health behaviors, clarification of any age and affective interactions impacting this relation is lacking. Specifically, the extent to which perceived functional limitation is associated with health-responsibility behaviors (i.e., seeking medical assistance, educating oneself on health issues) remains unclear. Identifying strong predictors of health responsibility is critical, with implications for the development of future health interventions. To begin to address the factors that may contribute to health-promoting behavior, we explored the relations between age, functional limitation, and health responsibility, while considering the mediating effects of positive and negative affect. The full model is depicted in Figure 1. Each path represents a specific hypothesis. We expected that older age would be associated with perceptions of more severe functional limitations and engagement in more health responsibility. We also expected that perceptions of more severe functional limitations would be associated with less positive affect and more negative affect. Further, we expected that more positive affect and less negative affect would be associated with engagement in more health responsibility.

Table 1
Means, Standard Deviations, and Intercorrelations among Constructs

			Correlations				
Variable	M	SD	1	2	3	4	5
1. Age (years)	52.91	9.84					
2. Body Mass Index (BMI)	27.53	4.32	-0.07				
3. Perceived Functional Limitation	6.23	5.40	0.20*	0.12			
4. Positive Affect	3.83	0.64	-0.03	-0.04	-0.35**		
5. Negative Affect	2.58	0.58	-0.12	0.07	0.34**	-0.50**	
6. Health Responsibility	2.36	0.53	0.08	0.05	0.10	0.40**	-0.12

* $p < .05$; ** $p < .01$

Method

Participants and Procedure

Data were collected via an online survey at a large mid-Atlantic University, where the study was approved by the institutional review board. Participants were middle-aged and older adults, who were recruited by means of undergraduate referrals. As part of a larger study, younger adults who were enrolled in undergraduate psychology courses completed the online survey for either course credit or extra credit and provided the primary investigator with their parents' and grandparents' contact information if they believed their family members would be interested in participating. The referred middle-aged and older adults received a postcard in the mail inviting them to participate in the online health promotion study. The postcard also provided instructions for accessing the study online along with a username and password so they could log in to the system and access the appropriate study. Participation in the online study was not timed and was contingent upon an online consent form, which included a description of the purposes of the study. The study was designed to allow participants to skip any question they did not want to answer. Participants who completed the online study were later mailed a postcard thanking them for their participation.

One hundred twenty-two community dwelling adults (men = 37, women = 85) took part in the parent study. Middle-aged and older adult participants were primarily White (91.2%), were residents of the Northeastern and Mid-Atlantic states, and ranged in age from 40 – 88 years (M = 52.91 years; SD = 9.84 years). Among the middle-aged and older adults, 32.8% had completed high school only, 45.1% had earned a 4-year college degree, and 20.5% had completed postbaccalaureate training. A small number of participants also had their spouse participate in the study (9.8%). To eliminate any statistical dependencies within the data, the current sample includes a subset of adults who are not related to each other.

Measures

Means and standard deviations for all measures are presented in Table 1.

Demographics. In addition to sociodemographic variables such as age, income, education, and marital status, body mass index (BMI) was calculated from participants' self-reported height and weight. A majority of participants (46.7%) were considered to be in the "overweight" category (BMI = 25.0 – 29.9) as a mean BMI score of 27.53 (SD = 4.32) was obtained. The remaining participants were normal weight (27.0%) and obese (26.2%).

Perceived Functional Limitation. Perceived functional limitations were assessed using six select items from the Health Condition Checklist from the National Long-Term Care Survey (NLTCS, 1992). Participants were asked to indicate whether they were experiencing any of 31 listed health conditions (e.g., heart trouble,

high blood pressure, diabetes) and rated the difficulty each condition caused them from "none" to "severe." Participants' responses were first coded for 1 (presence) or 0 (absence) of each of the 31 listed chronic health conditions. In order to calculate perceived functional limitation, the 1 (present) responses were then coded for severity: 1 (no difficulty), 2 (mild difficulty), 3 (moderate difficulty), and 4 (severe difficulty). Across both middle-aged and older adult age groups, participants similarly reported experiencing arthritis, back problems, breathing problems, high blood pressure, nervousness, sleeping problems, and asthma. As a result, these seven items were summed to create an index of perceived functional disability that was a result of their health condition status, such that higher scores indicate greater difficulty in dealing with their chronic health condition(s). In the present sample, participants reported having an average of 3.77 chronic health conditions (SD = 2.71) and an average severity composite of 3.42 (SD = 2.99) indicating that, on average, participants perceived mild difficulty for the seven selected chronic health conditions.

Positive and Negative Affect. Positive and negative affect was assessed using the 5-item Philadelphia Geriatric Center Affect Scales (PGC; Lawton, Kleban, Dean, Rajagopal, & Parmelee, 1992). Positive affect (PA) items included: happy, warm-hearted, content, energetic, and interested; negative affect (NA) items included: annoyed, irritated, sad, worried, and depressed. Participants were asked to indicate how often they felt each of the ten affective states during the past week. Item responses ranged from 1 (never) to 5 (very frequently) on a Likert-type scale and was scored such that higher scores indicated experiencing that emotional state more often. In the present sample, a mean PA score of 3.83 (SD = 0.64) on a scale of 1-5 was obtained, indicating that participants frequently experienced positive affect; a total NA score of 2.58 (SD = 0.58) on a scale of 1-5 was obtained, indicating that participants sometimes experienced negative affect. In the present sample, the coefficient alpha for the PA and NA scales were .84 and .82 respectively.

Health Responsibility. The 9-item Health-Responsibility subscale of the Health Promoting Lifestyle Profile II (HPLP II, Walker & Hill-Polerecky, 1996) was used to assess adults' sense of accountability for their well-being. In other words, it included behaviors such as educating one's self about health and seeking professional medical assistance. Item responses ranged from 1 (never) to 4 (routinely) and were scored such that higher scores indicate more engagement in health-responsibility behaviors. Sample items included statements such as, "I question health professionals in order to understand their instructions," and "I attend educational programs on personal health care." In the present sample, a mean score of 2.36 (SD = 0.53) on a scale of 1-4 was obtained, indicating that on average, participants engaged in some health-responsibility behaviors. The coefficient alpha for the subscale has ranged from .79 to .87 in previous research (Walker & Hill-Polerecky, 1996) and .86 in the present sample.

Results

Preliminary Analyses

As shown in Table 1, we examined the bivariate correlations among the measures. Significant correlations between variables provided preliminary support for the hypothesized associations within the path model. Specifically, older age was associated with perceptions of more severe functional limitations (r = .20, p < .05). Perceptions of more severe functional limitations was associated with less positive affect (r = -.35, p < .01) and greater negative affect (r = .34, p < .01). Lastly, greater positive affect was associated with engagement in more health-responsibility behaviors (r = .40, p < .01).

Analytical Strategy

To examine the relations among predictors, we conducted a path analysis, with the total sum of health-responsibility behaviors as our outcome variable. The predictor variables in our model were age, perceived functional limitation, positive affect, and negative affect. When determining sample size in statistical modeling, the number of cases to the number of parameters to be estimated should range from 5-10:1 (Byrne, 2001; Kline, 2005). The model tested in Figure 1 included 15 parameters, and thus our sample size of 122 was adequate. To assess whether each path was significant, the standardized maximum likelihood estimates (MLE) were inspected. The MLEs are similar to regression coefficients and were tested for significance using the critical ratios (CR; CR = MLE/SE of MLE). CR values

Table 2
Standardized and Unstandardized Estimates for Tested Model

Regression Paths	β	b	SE(b)	CR
Perceived Limitation <- Age	0.204	0.062	0.027	2.293*
Health Responsibility <- Age	0.056	0.027	0.039	0.685
Positive Affect <- Perceived Limitation	-0.344	-0.368	0.091	-4.024*
Negative Affect <- Perceived Limitation	0.341	0.327	0.082	3.989*
Health Responsibility <- Perceived Limitation	0.249	0.393	0.139	2.818*
Health Responsibility <- Positive Affect	0.514	0.766	0.139	5.526*
Health Responsibility <- Negative Affect	0.059	0.098	0.155	0.631

Note. CR = critical ratio; * p <.05

greater than 1.96 were interpreted as significant at the $p < .05$ level (Byrne, 2001; Kline, 2005). To assess the overall fit of the model, a chi-square statistic was examined. Nonsignificant chi-square values suggested no significant differences between the observed model and tested model. Because the chi-square statistic is strongly influenced by sample size and degrees of freedom, we evaluated a number of goodness-of-fit indices, including the comparative fit index (CFI), the normed fit index (NFI) and the root mean square error of approximation (RMSEA). CFI and NFI values greater than .90 indicate good model fit; RMSEA values less than .08 indicate acceptable model fit (Arbuckle, 1995; Byrne, 2001).

The hypothesized paths in Figure 1 were tested simultaneously. Results indicated a good fit of the data to the model, $\chi 2$ (df = 2; N = 122) = 5.433, p = .06; CFI = .961; NFI = .944; RMSEA = 0.08). The CFI and NFI suggest good fit; the RMSEA suggests acceptable fit. Moreover, the model accounted for 24% of the variance in health-responsibility behaviors, 12% of the variance in positive affect, and 12% of the variance in negative affect. Standardized and unstandardized regression weights and CR values are presented in Table 2. Perceived functional limitation (β = .25, $p < .05$) and positive affect (β = .51, $p < .05$) were each directly associated with health-responsibility behaviors. Perceived functional limitation was directly associated with less positive affect (β = -.34, $p < .05$) and more negative affect (β = .34, $p < .05$). Age was directly associated with perceptions of more severe functional limitations (β = .20, $p < .05$). Two of the hypothesized paths failed to reach significance (i.e., CR < 1.96). As shown in Table 2, significant direct effects of age and negative affect on health responsibility did not emerge.

Because perceived functional limitation exerted direct and indirect effects (through its association with positive affect) on health responsibility (see Figure 1), we conducted a Sobel test (1982) to test for mediation. A significant Sobel test indicates that the strength of the relation between the independent variable, (perceived functional limitation) and the dependent variable, (health responsibility) is significantly smaller when the mediator, (positive affect) is included in the model (Baron & Kenny, 1986). A significant Sobel test difference emerged (z = -3.26, $p < .05$), indicating that the perceived functional limitation – health responsibility association was significantly smaller when positive affect was controlled. In other words, positive affect emerged as a partial mediator of the functional limitation – health responsibility association.

Discussion

Perceived functional limitation is a strong predictor of disability (Guralnik & Ferrucci, 2003) and may be an important construct to consider when developing interventions aimed at disability prevention. However,

little is known regarding the way in which functional limitation may interact with affective beliefs to influence health-responsibility behaviors. Health-responsibility behaviors are especially important to consider in mid- to late life, as they may contribute to aging adults' functional independence. To further understand this relation, we explicitly tested the influence of age, perceived functional limitation, and affect in a model describing engagement in health responsibility.

Results of our path analysis indicate that perceived functional limitations exert direct and indirect effects, through its association with positive affect, on health responsibility. In addition, positive affect demonstrated a direct link to health responsibility, partially mediating the link between perceived functional limitation and health responsibility. Adults who perceived more severe functional limitations were more likely to engage in health-responsibility behaviors, and adults who perceived less severe functional limitations were more likely to report greater positive affect. Additionally, adults with greater positive affect were more likely to engage in health responsibility. Although research on the association between positive affect and health responsibility is limited, this finding is in accord with past research that suggests individuals' health behaviors are strongly influenced by affective beliefs (Hu & Gruber, 2008; Kelsey et al., 2006). It is possible that affective associations play a role in adults' health-related decision making. Although directionality cannot be inferred from the cross-sectional nature of the data, previous research suggests that those with greater positive affect may be choosing to engage in more health responsibility because they are more alert, resourceful, and better problem solvers (Frederickson & Joiner, 2002).

Interestingly, neither age nor negative affect were directly associated with health responsibility. Previous research (Leventhal et al., 2001; Walker et al., 1988; Zanjani et al., 2006) suggests age is directly associated with a variety of health-promoting domains. Our results suggest age is only indirectly associated with health responsibility through its association with perceived functional limitation. Older adults were more likely to participate in health responsibility if they perceived more severe functional limitations. Perhaps older adults who perceived greater difficulty in dealing with their chronic health conditions were more motivated to be better health consumers and consequently engaged in health responsibility as a means to decrease the likelihood they experience future illnesses.

Further, negative affect was not significantly associated with health responsibility and, unlike positive affect, did not partially mediate the relation between perceived functional limitation and health responsibility. Although adults who perceived more severe functional limitations reported more negative affect, negative affect was not associated with health responsibility. Although Mayne (1999) suggests negative affect may have a dimensional effect on health behavior, such that negative emotions may lead to more preventative health-care practices such as healthcare seeking, the data do not support this idea. Negative affect may be better able to predict engagement in health-compromising rather than health-promoting behaviors (e.g., substance use, overeating, etc.) Future research should further explore this link.

Despite the significant findings from this study, a number of limitations must be considered when interpreting the results and possible opportunities for future research. As cross-sectional data were used, causal links could not be inferred, only estimated conclusions regarding development could be made (Baltes, 1987). Generalizing the findings to other populations requires caution as the majority of the participants were White (91.2%), female (70%), and residents of the Northeastern and Mid-Atlantic regions. Thus, replication of the current findings in more diverse samples adults across the adult age span is warranted. Because the study was completed online, the current study may have been biased such that those with more resources (e.g., internet access) were more likely to respond to the recruitment ads and participate in the study. In addition, researchers can not verify what participants report (e.g., age, sex) during an online study.

Taken together, the results suggest that perceived functional limitation may be an important construct to consider when developing interventions aimed at slowing or reversing the disability process. Specifically, our data point to the need to consider affective influences on behavior in formal models of health-related decision making and to explore the possibility of developing affectively-based interventions to change health behavior. Similarly, these results may have implications for the use of positive affect as an indicator of health functioning among middle-aged and older adults with chronic illness.

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