Published in final edited form as:

Soc Sci Med. 2016 September ; 165: 28–35. doi:10.1016/j.socscimed.2016.07.021.

Affective Health Bias in Older Adults: Considering Positive and Negative Affect in a General Health Context

Brenda R. Whitehead and

Behavioral Sciences Department, University of Michigan–Dearborn, 4901 Evergreen Rd., CB 4057, Dearborn, MI 48128; Phone: 313-593-5493

C. S. Bergeman

Department of Psychology, University of Notre Dame, 118 Haggard Hall, Notre Dame, IN 46556; Phone: 574-631-0881

Brenda R. Whitehead: bwht@umich.edu; C. S. Bergeman: csbergema@nd.edu

Abstract

Rationale—Because subjective health reports are a primary source of health information in a number of medical and research-based contexts, much research has been devoted to establishing the extent to which these self-reports of health correspond to health information from more objective sources. One of the key factors considered in this area is *trait affect*, with most studies emphasizing the impact of *negative affect* (negative emotions) over *positive affect* (positive emotions), and focusing on *high-arousal affect* (e.g., anger, excitement) over *moderate- or low-arousal affect* (e.g., relaxed, depressed).

Objectives—The present study examines the impact of both Positive and Negative Affect (PA/NA)—measured by items of both high and low arousal—on the correspondence between objective health information and subjective health reports. Another limitation of existing literature in the area is the focus on samples suffering from a particular diagnosis or on specific symptom reports; here, these effects are investigated in a sample of community-dwelling older adults representing a broader spectrum of health.

Method—153 older adults ($M_{\text{age}} = 71.2$) took surveys assessing Perceived Health and Affect and underwent an objective physical health assessment. Structural equation modeling was used to investigate the extent to which the relationship between Objective Health and Perceived Health was moderated by PA or NA, which would indicate the presence of *affective health bias*.

Results—Results reveal a significant moderation effect for NA, but not for PA; PA appeared to serve a more mediational function, indicating that NA and PA operate on health perceptions in distinct ways.

Correspondence to: Brenda R. Whitehead, bwht@umich.edu.

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Conclusions—These findings provide evidence that in our high-functioning, community-dwelling sample of older adults, a) affective health bias is present within a general health context, and not only within specific symptom or diagnostic categories; and b) that both PA and NA play important roles in the process.

Keywords

Affective Health Bias; Positive Affect; Negative Affect; Physical Health

Self-reported health assessments are time- and cost-efficient methods for obtaining information about participants' health in broad-based research studies, particularly for samples, such as those of older adults, who may have some difficulty or apprehension in coming into the lab for a physical health assessment. Ideally, there is an "unbiased" association between objective and subjective health, where individuals appropriately draw on accurate objective health information when reporting their perceived health; the reality is, however, that there are a number of factors that can lead individuals to rely less on objective health information and thereby *bias* subjective health reports.

One of the most studied factors influencing a given person's self-health evaluation is *trait affect*, or one's general tendency toward negative and positive emotions; higher positive affect (PA) tends to be associated with better health perceptions, whereas higher negative affect (NA) is linked with poorer perceived health (Benyamini, Idler, Leventhal, & Leventhal, 2000; Bogaerts et al., 2005; Karsdorp, Kindt, Rietveld, Everaerd, & Mulder, 2007). In addition to its direct influence on health perceptions, affect can play a moderating role, impacting the association between objective health assessments and subjective health evaluations. For example, trait negative affect may moderate the relationship between objective and perceived health, such that for those higher in NA, objective health information is not as predictive of subjective health evaluations as it is for those lower in NA; this would indicate that those high in NA are not basing their self-health perceptions on objective health information to the degree that those lower in NA are, perceiving themselves as less healthy or capable than objective measures would indicate. Similarly, PA may bias health perceptions by leading individuals to downplay health problems. Note that although NA and PA have opposite biasing effects, both serve to reduce the extent to which the subjective health evaluations are reflective of actual health. The focus of the present study is the extent to which this *affective health bias*—in which the presence of trait affect reduces the tie between objective health information and subjective health evaluations—is present in a community sample of older adults.

It is important to recognize that affective health bias is not always maladaptive; for example, if having higher PA leads people to focus less on health problems and thereby see themselves as healthier than they would if they were lower in PA, then they may engage in more physical activity than they would if they saw themselves as less healthy, and as a result have more optimal health and functioning later on. However, affective health bias could be a problem if, for example, having higher NA leads people to place more weight on health problems and disabilities and less on abilities, resulting in more negative self-health evaluations than they would have if they were lower in NA; they may then disengage from

physical activity prematurely, resulting in accelerated functional decline. In the context of aging, these processes are especially salient, as indicators of physical function such as gait speed consistently predict morbidity and mortality outcomes in older adults (Van Kan et al., 2009).

A number of studies have compared objective health reports from physicians or medical records with self-reported health data collected directly from participants, and because they typically focus on specific diagnoses or medical procedures, they have reported fairly high agreement rates (Bergmann, Byers, Freeman, & Mokdad, 1998; Haapanen, Miilunpalo, Pasanen, Oja, & Vuori, 1997). Inaccuracy that exists in these specific contexts is likely due to lack of knowledge or information, memory issues, or overgeneralization (e.g., an individual confusing his or her malady with a diagnosis associated with a body part or anatomical function similar to, or in close proximity to, that affected by their own disease), rather than to biased perceptions (Bergmann et al., 1998; Nilsson, Johansson, Karlsson, & McClearn, 2002). Research indicates that inaccuracy resulting from affective bias is present when symptoms are short-term, sporadic, and/or have not been labeled with a specific diagnosis, or in the case of overall ratings of general health (Haapanen et al., 1997; Powell, Johnston, & Johnston, 2008).

Although there are many studies that have examined the presence of affective health bias within the context of specific symptoms (e.g., heart function; Karsdorp et al., 2007) or diagnoses such as asthma (Bogaerts et al., 2005; Janssens et al., 2009) and diabetes (Schandry, Leopold, & Vogt, 1996), few studies have investigated the presence of affective health bias as it impacts the association between objective and subjective measures of physical health in a more general context or sample. This is because specific symptoms make it easier to assess the degree of bias, as there is usually a very precise objective measure available against which to compare subjective assessments. For example, in the case of breathing symptoms associated with asthma, participants' perceptions of their breathing rate and depth can be directly compared to mechanical readings of his or her actual breathing rate and depth (Bogaerts et al., 2005). Similarly, heart patients' subjective reports of heart rate or arrhythmias can be compared to objective heart readings taken concurrently (Karsdorp et al., 2007). These symptom-specific methods provide important information regarding whether, and to what degree, affect impacts individuals' health perceptions within a given disease or symptom context. The specificity required by these approaches, however, also limits the generalizability of the findings, as the information one draws on when assessing one's health in these contexts is much more narrow and defined than is the case when more general health assessments (e.g., *How healthy am I?*) are made. It is therefore important to investigate the presence of affective health bias in a non-symptom-specific, general health context; this will permit the results to inform the extent to which trait affect impacts individuals' overall health perceptions in community-dwelling older adults, external of specific diagnoses or symptom schemas.

A second limitation of existing literature in the area is that studies tend to focus on the impact of *negative affect* (negative emotions) over *positive affect* (positive emotions), and on the influence of *high-arousal affect* (e.g., afraid, excited) to the exclusion of *lower-arousal affect* (e.g., relaxed, depressed). Studies of affective health bias most commonly investigate

the role of negative affect, which is consistently linked with under-assessments of overall health and over-reporting of symptoms (Bogaerts et al., 2008; Bogaerts et al., 2005; Karsdorp et al., 2007; Mora, Halm, Leventhal, & Ceric, 2007; Strigo, Simmons, Matthews, Craig, & Paulus, 2008). *Symptom Perception Theory* (Gijbbers van Wijk & Kolk, 1997) specifically identifies trait-level NA characteristics as the primary mechanism underlying biased health perceptions. Positive affect, although less studied in the context of health bias, also influences subjective health evaluations (Benyamini et al., 2000; Bogaerts et al., 2005; Pettit, Kline, Gencoz, Gencoz, & Joiner, 2001; Pressman & Cohen, 2005;). Very few studies have considered both PA and NA, and those that have typically use measures that focus on the high-arousal affect (Watson, 1988; Weisenberg, Raz, & Hener, 1998). Because there is evidence that lower-arousal affective experience may become more valued and/or salient in later life (Gross, Carstensen, Tsai, Skarpen, & Hsu, 1997), it is important to incorporate lower-arousal terms into the conceptualization of PA and NA when studying these processes in older adults. PA and NA are operationalized here using low- *and* high-arousal terms in order to acknowledge the findings that lower-arousal affective experience may become increasingly salient with age.

The present study is designed to shed light on the extent to which trait affect influences the relationship between older adults' general health, indicated by objective physical health measures, and their overall health perceptions. Two novel components of this investigation, each of which addresses a gap in the literature identified above, are 1) the examination of both positive and negative affect—comprising both high- and low-arousal affective elements—on the presence of health bias; and 2) the exploration of these effects and processes within the context of a general health evaluation, rather than being restricted to a specific diagnosis (e.g., asthma) or symptom (e.g., heart rate), using a community sample of older adults rather than a clinical sample. Because objective and perceived health are multi-faceted constructs, multiple indicators were obtained for each, using both survey and physical health data; Structural Equation Modeling (SEM) was therefore used to examine the presence of affective health bias—present when PA or NA significantly moderates (reduces) the relationship between Objective Health and Perceived Health—in our community sample of older adults.

Based on the rationale presented thus far, the hypotheses were as follows: Objective Health was expected to positively predict Perceived Health, as one's health perceptions are likely to be generally related to one's actual health. Once the affect factors were included as moderators, it was expected that a) both PA and NA would have significant direct effects on Perceived Health, with PA being associated with better subjective health ratings and NA being associated with poorer subjective health ratings; b) PA would reduce the relationship between Objective Health and Perceived Health, indicating the presence of positive affect bias; and c) NA would reduce the relationship between Objective Health and Perceived Health, indicating the presence of negative affect bias. Note that both affect variables are expected to reduce the link between Objective and Perceived health, as higher levels of either should lead individuals to rely less on objective health information when assessing their own health subjectively. Although the model including both PA and NA as simultaneous moderators was exploratory, NA was expected to maintain the stronger effect because NA tends to be more salient in the context of health than PA (Watson, 1988). Based

on the literature demonstrating a link between affect and objective health (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Steptoe, Dockray, & Wardle, 2006), the affect factors were expected to correlate with the Objective Health factor (PA associated with better Objective Health, NA associated with worse Objective Health). Finally, in the combined moderation model, the NA and PA factors were expected to demonstrate the moderate negative correlation with one another that is typical in the trait affect literature using similar measures (Russell & Carroll, 1999).

Method

Participants and Procedure

Participants were drawn from the Later Life Cohort of the Notre Dame Study of Health and Well-Being, a study aimed at investigating stress and resiliency processes in the context of aging; all aspects of the project were reviewed and approved by the Institutional Review Board at the University of Notre Dame. After signing a consent form, participants filled out surveys assessing health and affect, receiving \$20.00 as remuneration. In the wave of the study used here, the later life cohort had a total of 267 participants.

In the same year as these surveys were completed, 236 participants were contacted about participating in an in-person health assessment; of those, 153 (66.5%) agreed to participate, and these individuals comprise the present sample. The health assessment was conducted by a registered nurse, and a blood draw was performed and analyzed by the South Bend Medical Foundation in accordance with American Drug Administration regulations and guidelines. As part of this health assessment, participants' blood pressure, resting heart rate, height/weight, waist/hip circumference, hemoglobin a1c, and cholesterol were assessed; to get objective information about health conditions, releases were signed granting access to one year of medical records which were obtained from each participant's primary physician. Blood results were sent to the participant, as well as to his or her primary physician with participant consent. Subjects received \$100 in exchange for their participation in the health assessment.

Participants were aged 56–82 years ($M = 71.2$); 63% were female; 44% of participants are married, 24% are widowed, 23% are divorced or separated, and 9% are single; 97% have at least a high school education, and 36% have a college degree; the sample is 88% Caucasian, 7% African American, 2% Hispanic or Latino, 1% Asian or Pacific Islander, and 2% Other. Income is fairly normally distributed: 1% make less than \$7,500 annually, 15% earn between \$7,500 and \$14,999, 22% earn between \$15,000 and \$24,999, 28% earn between \$25,000 and \$39,999, 24% earn between \$40,000 and \$74,999, 5% earn between \$75,000 and \$99,999, and 5% earn \$100,000 or more. Because the in-person health assessment involves the participant coming into the lab, however, the members of the present sample tended to live closer to the lab and have higher levels of physical function than those who did not elect to participate. Rides to and from the lab were offered to all participants in an effort to reduce these potential differences.

Measures

Trait affect—A form of the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), with the 20 original high-activation items (PA items include *enthusiastic, excited*; NA items include *afraid, upset*) augmented with 6 lower-arousal affect terms (3 positively-valenced, 3 negatively-valenced), was used to assess trait affect. Added PA items were *cheerful, relaxed, and self-assured*; added NA items were *depressed, miserable, and worried*. Participants were asked to report “the extent to which you generally feel each emotion” on a scale from 1 (*Not at All*) to 5 (*Extremely*). In order to assess the expanded PA and NA scales, exploratory factor analysis (EFA) tested 2-, 3-, and 4-factor models on this expanded 26-item set and revealed that a 2-factor PA/NA solution omitting *guilt* and *shame* (both failed to load on any factor) was the best fit for the data; this was confirmed via confirmatory factor analysis (CFA), which revealed good model fit ($CFI = 0.927$; $RMSEA = 0.065$) for the 13-item PA scale and the 11-item NA scale. Completion rates for these individual affect items in the present sample were 98–100%. Each affect item was used as a manifest indicator of the latent PA or NA variable in the SEM analysis.

Objective health—Physical and physiological indicators taken in the physical health assessment were used to indicate participants’ objective health. All physiological measures were treated as continuous variables and were converted to z-scores to facilitate standardization; all indicators were also coded so that higher scores were associated with poorer health.

Physiological indicators: Metabolic and cardiovascular function—The degree to which one’s metabolism is functioning properly is strongly indicative of overall health and a reduced risk of both cardiovascular disease and diabetes. Although single indicators of metabolic function are informative, research has indicated that having unhealthy levels of multiple metabolic indicators is especially predictive of morbidity and mortality. These findings have led to the conceptualization of a *metabolic syndrome*, which is a clustering of factors that increase one’s risk for developing cardiovascular disease and other maladaptive health outcomes (Muntner, He, Chen, Fonseca, & Whelton, 2004; Seeman et al., 2010). The metabolic indicators used here are waist-to-hip ratio (98.5% complete), body mass index (BMI), hemoglobin a1c (99% complete), and the following lipids indicators: LDL, triglycerides, and cholesterol ratio (100% complete). Note that Cholesterol ratio (Total Cholesterol / HDL cholesterol, with Total Cholesterol = HDL + LDL) is used instead of the raw HDL value because important information can be gleaned by accounting for the relationship between LDL and HDL cholesterol on top of the individual values (Lemieux et al., 2001).

Although metabolic functioning is strongly associated with the development of future cardiovascular disease, indicators of heart function provide a direct assessment of current cardiovascular performance, as well as overall health. Indicators used here include resting heart rate, with two 30-second counts ($\times 2$ to calculate beats per minute) taken on the wrist 5 minutes apart and averaged (98.5% complete); and both systolic and diastolic blood pressure, with two measurements taken 5 minutes apart and averaged (98.5% complete).

In order to establish manifest indicators of the latent Objective Health Factor that were both theoretically and statistically sound, EFA was used to examine the factor structure of the physical/physiological indicators. The results indicated a clean 3-factor clustering which was confirmed via CFA ($CFI = 0.92$; $RMSEA = 0.09$) and fits with what would be expected theoretically. This resulted in the following three variables: The Obesity Indicator was comprised of waist/hip ratio, BMI, and hemoglobin a1c; the Lipids Indicator was comprised of LDL, cholesterol ratio, and triglycerides; and the Cardiovascular Indicator was comprised of heart rate, SBP, and DBP. Composite variables for each of these domains were calculated by summing the z-scores for each component indicator (e.g., Metabolic Indicator = $z\text{Waist-Hip ratio} + z\text{BMI} + z\text{A1c}$); these three composite variables were then standardized ($M=0$, $SD=1$) and used as manifest variables in the Measurement Model for the latent Objective Health factor ($z\text{Obesity}$, $z\text{Lipids}$, $z\text{Cardiovascular}$).

Diagnoses—In addition to the physiological risk factors of disease assessed, an individual's actual diagnoses—specifically those of cardiovascular disease, diabetes, stroke, cancer, and hypertension—were obtained from his or her medical records and used as a fourth manifest indicator of the latent Objective Health factor. Along with being the diseases most directly predicted by the physiological indicators used in the present project, these five diseases are among the most prevalent in the United States, and are also those most closely linked with mortality in older adults (Mokdad et al., 2003; Ong, Cheung, Man, Lau, & Lam, 2006; Wilson et al., 1998; Wolf, D'Agostino, Belanger, & Kannel, 1991). The diagnosis variable is a count variable, so that a score of 5 indicates the presence of all five diagnoses of interest, whereas a score of 0 reflects their absence. The diagnosis score was standardized ($M=0$, $SD=1$) and used as a manifest indicator for the latent Objective Health factor ($z\text{Diagnoses}$). Medical records information was complete for 94% of participants.

Perceived health—The Perceived Health items were drawn from the Self-Rated Health scale used by Harris, Pedersen, McClearn, Plomin, and Nesselroade (1992). They include: *How would you rate your general health status*, rated on a 4-point scale (1 = excellent, 4 = poor); and *How would you rate your present health status compared to 5 years ago*, and *How would you rate your health status compared to others in your age group*, both rated on a 3-point scale (1 = better, 2 = about the same, 3 = worse). In the present sample, each of these items had a 99% completion rate. Each of these items was standardized ($M = 0$, $SD = 1$) and used as a manifest indicator of the Perceived Health Factor ($z\text{Overall Health}$, $z\text{Past Health}$, $z\text{Peer Health}$).

In addition, a somatic health measure assessing self-reports of non-specific physical complaints—such as shortness of breath, back pain, frequent headaches, and joint pain—was included as a fourth manifest indicator of the latent Perceived Health factor to capture the physical complaints often correlated with health perceptions and not necessarily indicative of objective health ($z\text{Somatic Health}$). The 12 somatic health items are in a checklist form (Belloc, Breslow, & Hockstim, 1971), with the assessment treated as a count variable, so that all *Yes* responses are scored as 1 and all *No* responses receive a score of 0. A total score of 0 indicates no somatic health complaints, whereas higher scores indicate

more somatic health problems; total scores were standardized ($M=0$, $SD=1$). Participant data were 95% complete on this variable.

Statistical Procedures

A structural equation modeling (SEM) approach was used to test the hypotheses, where the measured variables are used as manifest indicators of latent (unobserved) factors representing each construct (Objective Health, Perceived Health, Positive Affect, Negative Affect). A SEM analysis involves two main steps: first measurement models are run to ensure that the observed variables being used to estimate the latent factors are valid; then structural models assess the relationships among the latent factors. As is standard practice, the highest-loading indicator was fixed to 1.0 for each factor (PA=interested; NA=distressed; Objective Health=zObesity; Perceived Health=zOverall Health) in order to scale the factor. Note that the Latent Moderated Structural Equations (LMS; Klein & Moosbrugger, 2000) procedure used for the estimation of the latent interaction parameters relies on the Estimation Maximization (EM) algorithm, which provides maximum likelihood estimates of model parameters but does not permit standard SEM model fit indices like *CFI* or *RMSEA* to be calculated. For this reason, only the log-likelihood values are displayed for these models in Table 2. Because the loss of any participant data due to missingness on one or two indicators is undesirable, maximum likelihood estimation was used to capitalize on all of the available data from each participant. All parameter estimates reported are in their unstandardized form. All models were run using the Mplus statistical package (Muthen & Muthen, 1998–2010).

Results

Descriptive Statistics

The means, standard deviations, and correlations of the variables used in the analyses are shown in Table 1. All significant correlations are in the expected directions; importantly, all of the variables intended to indicate a given factor correlate significantly with one another (e.g., the zObesity, zLipids, zCardiovascular, and zDiagnosis variables—all manifest indicators of the Objective Health factor—are significantly related to each other). The highest correlation among predictor variables was for a) zSomatic Health and zOverall Health ($r = 0.50$, $p < .001$); and b) zDiagnoses and zObesity ($r = 0.50$, $p < .001$). Age is positively correlated with zDiagnosis ($p < .05$) and zSomatic Health ($p < .01$).

Measurement Models

Objective health—The four manifest indicators of the latent Objective Health factor were zObesity, zLipids, zCardiovascular, and zDiagnoses. Parameters estimated included 3 factor loadings for the clusters derived from the EFA/CFA analysis described above (zLipids = 0.479, $p < .0001$; zCardiovascular = 0.403, $p = .004$; zDiagnoses = 0.700, $p < .0001$), 4 residual variances (one for each indicator, all significant), and the factor variance for the Objective Health factor (0.704, $p < .0001$). The loading for the zObesity variable was fixed to 1.0 for scaling. In terms of model fit, the *RMSEA* (0.131) is somewhat higher than desired, but the χ^2 (7.22, $p = .027$) and *CFI* (0.93) indices are within acceptable ranges, indicating reasonable fit.

Perceived health—The four manifest indicators of the latent Perceived Health factor were zOverall Health, zPast Health, zPeer Health, and zSomatic Health. The measurement model for the latent factor of Perceived Health reveals that all factor loadings (zPast Health = 0.835, $p < .0001$; zPeer Health = 0.643, $p < .0001$; zSomatic Health = 0.993, $p < .0001$) were significant, with the loading for the zOverall Health variable fixed to 1.0 for scaling. The 4 residual variances were also significant ($p < .0001$), as was the factor variance for the latent Perceived Health factor (0.510, $p < .0001$). The fit indices demonstrate very good fit: $\chi^2(2) = 2.82$, $p = .245$, $CFI = 0.99$, $RMSEA = 0.052$.

Affect—Each affect item loaded significantly ($p < .0001$) on the respective Positive Affect (13 items) or Negative Affect (11 items) factor, with *Interested* and *Distressed* fixed to 1.0 for scaling; all residual variances were statistically significant as well ($p < .0001$) for the Positive and Negative Affect factors. The estimated factor loadings for the latent Positive Affect factor ranged from 0.576 for *relaxed* to 0.950 for *strong*; 8 of the 13 items had loadings greater than 0.8. The estimated factor loadings for the latent Negative Affect factor ranged from 0.615 for *hostile* to 0.951 for *nervous*; 7 of the 11 items had loadings greater than 0.8. The factor variance for Positive Affect was 0.621 ($p < .0001$), and that for Negative Affect was 0.722 ($p < .0001$). The final models also include residual covariances estimated based on initial modification indices: for PA, residual covariances were estimated for active/enthusiastic, cheerful/relaxed, interested/inspired, and strong/active; for NA, residual covariances were estimated for scared/afraid, irritable/hostile, and jittery/nervous. The model fit indices for each of these measurement models demonstrate good fit. For PA, $\chi^2(61) = 118.78$, $p = .000$; $CFI = .94$; $RMSEA = .079$; for NA, $\chi^2(41) = 63.51$, $p = .014$; $CFI = .98$; $RMSEA = .060$.

Structural Models

The parameter estimates, standard errors, and p-values of the structural model parameters are shown in Table 2 for each structural model.

Initial model—The initial structural model testing the effect of the latent Objective Health factor on the latent Perceived Health factor (Figure 1) revealed a significant effect in the hypothesized direction, such that having worse objective health predicted worse subjective health ratings ($\beta = 0.336$, $p = .003$). The model fit indices demonstrate excellent fit, as the χ^2 is nonsignificant ($p = .09$), the CFI is nearly 1.0 (.96), and the $RMSEA$ is equal to .05.

PA moderation model—The model testing the individual moderating effect of positive affect came next (Figure 2). Both direct effects were significant, such that worse objective health was significantly associated with worse perceived health, as before ($\beta = 0.310$, $p = .008$); and higher positive affect was linked with better subjective health evaluations ($\beta = -0.380$, $p < .0001$). The PAxObjective Health interaction parameter, however, was not significant, meaning that the link between objective health and subjective health perceptions was not moderated by PA in this model.

NA moderation model—In the individual NA moderation model (Figure 3), the direct effects of both Objective Health ($\beta = 0.308$, $p = .003$) and Negative Affect ($\beta = 0.257$, $p = .$

012) were significant, as was the interaction parameter ($\beta = -0.187, p = .036$). Thus, there is evidence for the presence of NA health bias in this model.

Combined moderation model—When both PA and NA were included as latent moderators of the link between the Objective and Perceived Health factors (Figure 4), the only significant effects were for Objective on Perceived Health ($\beta = 0.290, p = .003$), PA on Perceived Health ($\beta = -0.339, p = .001$), and the covariance between the latent NA and PA factors ($\Psi = -.147, p = .023$). The interaction parameter for NA ($p = .065$) does not maintain significance when PA is included in the model.

Discussion

As outlined in the introduction, this project draws on the existing literature on affective health bias, investigating the role of trait-level affective characteristics in serving to bias older adults' self-perceptions of health. The unique components of this study—the investigation of both Positive and Negative Affective Health Bias and the more general conceptualization of affective health bias using a non-clinical sample—each align with gaps in the literature, leading the results to contribute to a more complete understanding of health bias processes in older adults. The results did reveal the presence of affective health bias within a non-clinical sample of older adults, aligning with similar evidence that has been found on the daily level (Whitehead & Bergeman, 2013) and shedding light on how affective health bias manifests within more general contexts.

The hypothesis regarding NA health bias was largely confirmed through the significant interaction parameter in the NA Moderation Model, and supported by the nearly-significant bias parameter in the Combined moderation model (Figure 4; $p = .065$). These results align with previous experimental findings in the area, which have found trait-level affect (particularly NA) to bias health perceptions (e.g., Bogaerts et al., 2008; Bogaerts et al., 2005; Karsdorp et al., 2007; Mora et al., 2007; Strigo et al., 2008); the significant NA health bias effects also support the foundations of Symptom Perception Theory (Gijsbers van Wijk & Kolk, 1997). No evidence for the presence of PA-biased health perceptions, however, emerged in the analysis. The direct effects hypotheses were confirmed, as Objective Health, PA, and NA each impacted Perceived Health in the hypothesized direction; that is, being less healthy and endorsing higher levels of trait NA predicted worse subjective health evaluations, whereas higher levels of trait PA were associated with better perceived health. Note that these direct effects of affect on Perceived Health reflect trait factors influencing self-health evaluations, not affective health bias; the latter, rather, is the extent to which affect impacts the *relationship* between objective health information and subjective health assessments.

Although the hypothesized moderating effect of PA in the form of health bias was of interest here, the evidence suggests that a mediational role may be a better characterization of PA's function; that is, in all cases in which trait level affect was added to the model, the parameter estimate for the Objective-Subjective health association was substantially reduced, indicating that some of that effect was *explained by* the presence of PA in the model. So it may be that, in this more general context, rather than the link between Objective and

Perceived Health *depending* on trait affect (moderation), it partially operates *through* trait affect, so that having better health leads to more positive affect, which in turn results in more positive subjective health evaluations. We cannot, however, truly know the direction of this effect with the present data, as PA was assessed at the same time as Perceived Health; future longitudinal studies considering both PA and NA in the context of subjective health evaluations should therefore compare the utility of the affective health bias conceptualization (affect moderates the objective-perceived health link) with the more process-oriented conceptualization (objective health→affect→perceived health) implied by a mediational effect. It may be that PA and NA influence the association between objective and perceived health differently; NA may moderate the link, leading individuals to place more weight on health problems in the moment they are evaluating their health. PA, on the other hand, may operate via mediation; that is, having better objective health lifts PA, which in turn leads to more positive self-health evaluations than would be present if not for the health-related PA boost. Note that these two processes reflect different levels of affective influence; the impact of NA would be more immediate or in the moment of evaluation, whereas the role of PA would be more global, influencing outlook in general (not just in the context of health evaluation). This distinction aligns well with the ideas of Fredrickson (2004), who suggests that negative emotions are narrower in scope and more specific in influence, whereas positive emotions serve to broaden our perspective by prompting behaviors aimed at play, exploration, and savoring.

Limitations

Although the current project was designed to bridge a number of gaps present in the health bias literature, it is not without its limitations. First, because the data are drawn from a larger project investigating a myriad of health and well-being processes in midlife and older adults, the measures and methods were not developed and/or selected specifically with the present project in mind. For example, the self-report measures (affect and perceived health) were taken at a different time and location than were the in-person objective health assessments, although they tended to be within a few months of each other; future studies with more direct alignment in the measurement of objective and perceived health will be able to more strongly test the hypotheses of interest here. The measurement of objective health is also limited in that it does not encompass every possible physiological system (e.g., immune function, respiratory illness); despite this, the multi-system approach used captures much more information about overall health than would a single-domain assessment. A second limitation is that the sample used here consists primarily of well-educated Caucasian older adults, which means that the present results are not necessarily generalizable to seniors of other ethnicities or levels of education. Finally, the scope of the present project did not permit the consideration of other potentially relevant factors such as personality (to what extent do trait PA and NA influences on health evaluations reflect the impact of personality differences?) and mental health (do individuals with a mental health diagnosis show similar patterns of affective health bias? Is affective health bias present in the context of mental health, as opposed to physical health?). All of these represent important future directions.

Future Directions and Conclusions

Another important avenue for further study is whether and how these affective health biases impact long-term health and well-being outcomes, particularly via their impact on health behaviors; it may be that longitudinal studies will find that positively- or negatively-biased health perceptions can be either adaptive or maladaptive, depending on the person or the context. For example, if self-health reports and perceptions are positively biased, then individuals may not be as aware of potential issues and may take less care in considering long-term health ramifications of everyday health decisions; this may lead to poor prognosis down the line, as poor health monitoring results in undetected or ignored illness. On the positive side, however, they may continue an active lifestyle longer than they may have if they “knew” that their health was worse than they thought; this, along with the mental health benefits of having a positive frame of mind, may actually promote health, or at least buffer the deleterious impact of positive bias on health behaviors. On the other hand, if one’s health perceptions are biased by negative affect, he or she may be hypersensitive to any given malady and over-utilize medications and physician visits, placing undue burden on the already overwhelmed healthcare system. It is also likely, however, that the additional vigilance of these individuals leads to early detection of diseases that do exist, perhaps serving to promote their health in the long run, assuming the negative mindset is not so pervasive that it has a deleterious impact on other facets of functioning. A study investigating these behavioral links would shed greater light on the extent to which the biased health perceptions explored here have long-term ramifications on health, or if their role is largely restricted to the realm of information inaccuracies.

In the context of using self-reported health measures as a proxy for objective health measures in research, researchers are generally aware that subjective assessments do not provide an exact representation of objective health, but they are not necessarily aware of the factors that may influence the extent to which these subjective health measures align with what more objective assessments would indicate. By understanding the influence of these psychosocial factors—such as affect—and controlling for them in research, we can do more to ensure that the subjective health measures we use are more reflective of actual health and less tied to the individual’s personality characteristics or reporting tendencies.

Overall, the present study contributes to the literature by empirically informing the biasing effects of both positive and negative affect in the context of perceived health, and by conceptualizing affective health bias in a general, non-diagnosis- or symptom-specific manner. The results shed light on affective health bias processes as they operate broadly in the lives of community-dwelling older adults and lay the groundwork for a myriad of future studies, which will continue to shed light on the antecedents and consequences of affect-related health bias.

Acknowledgments

This work is supported by the National Institute on Aging under Grant 1 R01 AG023571-A1-01; the John Templeton Foundation under Grant 20794.

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Highlights

- Investigates affective health bias in community-dwelling older adults.
- Finds affective health bias in a general health context.
- Finds Negative Affect moderates the link between Objective and Perceived Health.

Figure 1.

Initial Structural Model Results. ξ_{OH} = variance estimate for the Objective Health factor; β_1 = parameter estimate for effect of Objective Health on Perceived Health; δ_{PH} = disturbance term for the Perceived Health factor. * $p < .05$; ** $p < .01$; *** $p < .001$

Figure 2.

PA Moderation Model Result. ξ_{OH} = variance estimate for the Objective Health factor; ξ_{PA} = variance estimate for the Positive Affect factor; δ_{PH} = disturbance term for the Perceived Health factor. * $p < .05$; ** $p < .01$; *** $p < .001$

Figure 3.
NA Moderation Model Results. ξ_{OH} = variance estimate for the Objective Health factor;
 ξ_{NA} = variance estimate for the Negative Affect factor; δ_{PH} = disturbance term for the
Perceived Health factor. * $p < .05$; ** $p < .01$; *** $p < .001$

Figure 4. Combined Affect Moderation Model Results. ξ_{OH} = variance estimate for the Objective Health factor; ξ_{PA} = variance estimate for the Positive Affect factor; ξ_{NA} = variance estimate for the Negative Affect factor; δ_{PH} = disturbance term for the Perceived Health factor. $*p < .05$; $**p < .01$; $***p < .001$

Table 1

Descriptive statistics ($N = 153$)

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. zObesity	0.00	2.10	--									
2. zLipids	0.00	2.59	.32***	--								
3. zCardiovascular	0.00	2.32	.25**	.30***	--							
4. zDiagnoses	1.07	0.96	.50***	.17*	.19*	--						
5. zOverall Health	1.93	0.71	.23**	.09	.03	.18*	--					
6. zPast Health	1.46	0.56	.10	.04	-.05	.01	.26**	--				
7. zPeer Health	2.13	0.59	.22**	.06	.02	.32***	.42***	.31***	--			
8. zSomatic Health	1.88	1.73	.19*	.04	-.02	.20*	.50***	.37***	.39***	--		
9. Positive Affect	49.14	7.53	-.09	-.10	-.10	.05	-.38***	-.20*	-.25**	-.27**	--	
10. Negative Affect	16.53	6.19	.20*	-.04	.08	.20*	.21*	.13	.11	.21*	-.22**	--
11. Age	71.31	5.06	.01	.02	-.01	.21*	.09	.09	-.07	.22**	.04	.02

NOTE: Means and Standard Deviations (*SD*) of standardized variables are in their unstandardized form. Variables 1–4 are the manifest indicators of latent Objective Health; variables 5–8 are the manifest indicators of latent Perceived Health. Rather than presenting the individual affect item correlations, the combined affect terms are used here to establish the degree of correlation between affect and the other variables. For correlations,

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 2

SEM Results for Structural Models

Parameter	Unstandardized	SE	p-value
Initial Structural Model (Figure 1)			
Objective Health → Perceived Health	0.336	0.114	0.003**
Disturbance Estimate—Perceived Health	0.464	0.118	0.000***
PA Moderation Model (Figure 2)			
Objective Health → Perceived Health	0.310	0.118	0.008**
PA → Perceived Health	−0.380	0.101	0.000***
PA x Objective Health → Perceived Health	0.043	0.151	0.773
Affect/Health Covariance	−0.056	0.059	0.342
Disturbance Estimate—Perceived Health	0.392	0.113	0.000***
NA Moderation Model (Figure 3)			
Objective Health → Perceived Health	0.308	0.102	0.003**
NA → Perceived Health	0.257	0.102	0.012**
NA x Objective Health → Perceived Health	−0.187	0.089	0.036*
Affect/Health Covariance	0.182	0.109	0.094
Disturbance Estimate—Perceived Health	0.414	0.113	0.000***
Combined Moderation Model (Figure 4)			
Objective Health → Perceived Health	0.290	0.098	0.003**
PA → Perceived Health	−0.339	0.099	0.001***
NA → Perceived Health	0.182	0.094	0.052
PA x Objective Health → Perceived Health	−0.001	0.145	0.996
NA x Objective Health → Perceived Health	−0.156	0.090	0.065
PA/Health Covariance	−0.058	0.058	0.318
NA/Health Covariance	0.176	0.109	0.108
PA/NA Covariance	−0.147	0.065	0.023*
Disturbance Estimate—Perceived Health	0.362	0.106	0.001***
Structural Model Fit			
Initial Structural Model	$\chi^2(19) = 27.53, p = .09; CFI = .96; RMSEA = .05$		
	# Par: 25; -LL = 1587.64; AIC = 3252.81		
PA Moderation Model	# Par: 71; -LL = 3909.97; AIC = 7691.95		
NA Moderation Model	# Par: 64; -LL = 3445.04; AIC = 7018.08		
Combined Moderation Model	# Par: 111; -LL = 5752.90; AIC = 11727.79		

NOTE: Significant effects are **bold** ($p < .001$); **bold italics** indicate $p < .01$; *italics* indicate $p < .05$; standard deviations are shown in parentheses. # Par = the number of parameters estimated in the model; -LL = log likelihood. AIC = Akaike Information Criterion; AIC permits the comparison of non-nested models, with lower values indicating better model fit.