ABSTRACT

GROWNEY, CLAIRE MARIE. The Role of Affect-based Resources in Older Adults’ Information Gathering and Activity Engagement. (Under the direction of Dr. Thomas M. Hess).

This dissertation reports the results of four different studies included in three different manuscripts that addresses the ways in which older adults might leverage their affect-based resources for their benefit. Notably, these resources may be context-specific and state-like, or trait-like characteristics of an individual. The questions explored in this dissertation were initially inspired by the Mood as Resource framework (Trope et al., 2006), which suggests that individuals may be more willing to attend to negative but important information in situations where they are feeling positive, as their positive mood may serve as a buffer against the negative affective consequences of attending to such information. I wanted to apply these ideas to older adults and expected that positive mood might be a particularly important resource for older adults, given research suggesting their relative maintenance of and disproportionate focus on emotional well-being (eg., Carstensen et al., 1999). The first manuscript is an experimental study in which we attempted to manipulate young and older adults’ moods by having them reflect on their feelings associated with a cognitive success or failure. Afterwards, they selected feedback about their strengths and/or weaknesses on a cognitive task completed earlier. Older adults demonstrated the trend proposed by the Mood as Resource framework: those in the negative condition were less willing to view their weaknesses than those in the positive condition, suggesting that mood served as a resource. However, it was unclear whether mechanism responsible for the effect was mood or self-perceptions in the domain of interest. In the second manuscript, we investigated this question by including positive and negative traditional mood manipulation conditions as well as positive and negative health behavior perception manipulation conditions. After the construct of interest was manipulated, participants selected
positive and/or negative but informative health-related articles to read. We replicated the results from the first manuscript in older adults who were exposed to the health behavior perception manipulation and found that older adults’ self-perceptions influenced decisions to view negative articles through self-reported information-gathering goal priorities. In a follow-up study, we found that self-perceptions served as a resource only when the information to-be-gathered, which was health-related articles in this case, was viewed as informative. In the third manuscript, we took a longitudinal approach and examined emotional health as an affect-based resource. Using archival data, we found that changes in motivation mediated the relationship between changes in emotional health and changes in cognitively demanding activity engagement for older adults. In the general discussion section, I examine the implications of these three manuscripts and how they relate to theory building for the Mood as Resource framework (Trope et al., 2006), Socioemotional Selectivity Theory (Carstensen et al., 1999), and Selective Engagement Theory (Hess, 2014). I conclude with a discussion of limitations and future directions for research.
The Role of Affect-based Resources in Older Adults’ Information Gathering and Activity Engagement

by
Claire Marie Growney

A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Psychology

Raleigh, North Carolina 2019

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BIOGRAPHY

Claire Growney grew up in Rochester, New York. She completed her Bachelor of Science degree in 2013 at the University of Mary Washington in Fredericksburg, Virginia, where she double-majored in psychology and music. In 2014, she entered the lifespan developmental psychology graduate program at North Carolina State University. During her time at North Carolina State University, she worked as a research assistant in the Adult Development Lab under the direction of Dr. Thomas Hess.
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Introduction

In everyday life, people are presented with situations in which they must make decisions that have both short-term and long-term effects in a variety of domains. In some cases, short-term negative affective consequences must be weighed against a long-term benefit. For example, when gathering information about a medical diagnosis, negative emotions may arise from consideration of the risks associated with various treatments, but ultimately people tend to cope with medical situations best when fully informed (e.g., Berg et al., 2008). Similarly, it may be discouraging to engage in an activity that is very demanding of cognitive resources, but engaging in these types of activities has been shown to relate to maintained cognitive ability (Hertzog, Kramer, & Lindenberger, 2009). One might expect individuals across the adult lifespan to approach such decisions differently, according to their available resources and goal priorities.

Some research suggests that older adults may disproportionately focus on positive information with the goal of maintaining emotional well-being (Carstensen & Mikels, 2005; Reed, Chan & Mikels, 2014). Socioemotional Selectivity Theory (SST; Carstensen, Isaacowitz, & Charles, 1999) suggests that as perceptions of future time decrease with age, older adults become increasingly focused on emotional well-being in the present as opposed to gathering information for future use. As a result, older adults may be more likely than younger adults to attend to relationships and stimuli that are emotionally gratifying, and prefer positive over negative information to a greater extent than young adults do (Carstensen & Mikels, 2005). However, this “positivity effect” has been shown to be moderated by a number of situational factors. A number of studies demonstrate that older adults do not always focus more on positive information (e.g., English & Carstensen, 2015; Hess, Popham, Dennis, & Emery, 2013; Knight, Seymour, Gaunt, Baker, Nesmith, & Mather, 2007; Löckenhoff & Carstensen, 2008; Chung,
2010), with the effect being moderated by factors such as the nature of stimuli (e.g., arousal level, informativeness, relevance, viewing instructions). One general consensus is that processing constraints decreases the strength of the age-related positivity effect (Reed et al., 2014). However, there is a lack of theoretical consistency in the nature of these processing constraints, and such constraints are not a normal part of everyday life for older adults. Thus, it is important for us to better understand the conditions under which older adults are willing to expose themselves to negative situations that might have long-term positive effects in the absence of such artificial constraints. These positive long-term effects are not limited to but may include: functional improvements in a given domain as a result of attention to areas for improvement, satisfaction with a medical decision as a result of attention to negative information such as risks and side effects, and maintained or enhanced cognitive health as a result of effortful engagement in demanding activities.

One possibility is that older adults might be able to use their proposed propensity for positive states to their advantage, using them as a resource in certain contexts. The Mood-as-Resource perspective (e.g., Trope, Ferguson, & Raghunathan, 2001, Trope & Pomerantz, 1998) suggests that positive mood may serve as a buffer for the negative emotional consequences that often come with exposure to negative self-relevant information, increasing one’s willingness to attend to such information. With the requirement that the information to be gathered is viewed as diagnostic, meaningful, or helpful to the learning process (e.g., Trope & Gervey, 2000; Raghunathan & Trope, 2000), positive affect, beliefs, and experiences may have a facilitative effect on information-gathering, whereas negative affect, beliefs, and experiences may lead individuals to use available resources for coping rather than learning (e.g., Das, Vonkeman, & Hartmann, 2012; Fishbach, Eval, & Finkelstein, 2010; Fishbach & Labroo, 2007; Trope, Igou, &
Burke, 2006). Studies of young adults have demonstrated associations between positive mood and interest in meaningful weakness-related feedback or negative information in the domains of cognition (e.g., Gasper & Zawadzki, 2013) and health (e.g., Schuettler & Kiviniemi, 2006), but the potential for mood to serve as a resource in older adulthood has yet to be explored.

Although not specifically tied to emotional resources, Selective Engagement Theory (SET; Hess, 2014) is another relevant perspective to this dissertation. The theory suggests that the normative declines that occur in physical and cognitive resources in later life lead to an increase in the costs associated with engaging in demanding activities. As costs increase with age, older adults may become less motivated to engage their resources in activities that are demanding of the resources in question. Motivation has been shown to play a key role in the relationship between resources (e.g., cognitive ability, physical health, and sensory functioning) and engagement in demanding activities in both cross-sectional (Hess, 2001; Queen & Hess, 2018; Hess, Growney, O’Brien, Neupert, & Sherwood, 2018) and longitudinal examinations (Hess, Emery, & Neupert, 2012). The potential role of emotional resources has yet to be investigated within the context of SET. Throughout later life, individuals tend to experience improvements in mental health (e.g., Henderson et al., 1998) and emotional well-being (e.g., Cacioppo et al., 2008). Emotional health is a resource which encompasses both mental health and emotional well-being. To the extent that older adults maintain relatively high levels of emotional health as they age, consideration of emotional health as a resource influencing motivation and engagement may lead to a more complete understanding of the reasons why some older adults choose to engage in demanding activities while others do not.

The following papers in this dissertation investigate the ways in which older adults might be able to draw upon various affect-based resources to encourage optimal behaviors in different
situations. The manuscripts presented here are examinations of the role of affect-based resources in young and older adults’ attention to information that is negative but beneficial, and engagement in activities that are demanding of resources but beneficial.

**Manuscripts**

**Manuscript 1: Affective influences on older adults’ attention to self-relevant negative information**

The first manuscript examines the possibility that older adults may be more willing to consider negative information when in a positive mood, with positive affect serving as a buffer to the adverse emotional consequences that may follow. Examining feedback viewing behavior in the domain of cognitive ability, we hypothesized that once the presumed goal of maintaining positive affect has been met, older adults would experience greater flexibility in their information gathering behaviors, allowing them to focus on helpful negative feedback. In contrast, older adults who have not fulfilled their presumed chronic affective goal would focus disproportionately more on positive feedback (compared to young adults) in an effort to achieve this goal.

Given our interest in emotion and information-focused goals, we felt it necessary to objectively measure these goals rather than rely on behavioral results to infer goal orientations as has been done in the past. Thus, we created a Goal Prioritization Inventory (GPI) with Emotion Regulation and Information Gathering subscales. Cronbach’s alpha for the overall scale was .75, and was .66 for each of the subscales, suggesting that reliability is acceptable for the exploratory purposes of our study.

Sixty-two young adults (age 18-28) and 65 older adults (age 65-89) first completed a moderately difficult cognitive task on the computer (a modified version of the Everyday
Cognition Battery: ECB; Allaire & Marsiske, 1999) in which they were expected to experience both failure and success. The task assessed reasoning, memory, working memory, and knowledge in three relevant everyday domains: nutrition, finances, and medication. Next, as a mood induction, participants completed either a positive or negative experience recall task in which they thought and wrote about a recent time they were required to use their cognitive abilities and were either pleased or displeased with the result. Participants then reported their current goal priorities using our GPI. Lastly, participants were given the opportunity to view feedback about their performance on the ECB. A table of six cells was presented, indicating options to view feedback about strengths or weaknesses in each of the three domains included on the ECB. Participants were instructed to select three pieces of feedback to view, and could therefore select between zero and three weaknesses. Assessments of mood were collected throughout the procedure using the Self-Assessment Manikin (SAM; Lang, 1980).

Our manipulation check confirmed that our experience-recall tasks successfully induced positive or negative feelings, according to condition. Results from our main analyses revealed that older adults in the positive experience recall condition selected more weaknesses to view, were more likely to select a weakness to view first, and spent more time viewing weaknesses than older adults in the negative experience recall condition. Surprisingly, there were no differences across conditions in behavioral results for young adults. We were also surprised to not find an association between reports of mood and interest in viewing weaknesses, suggesting that mood might not be the underlying mechanism. Regarding our GPI measure, we found that for older adults in the positive condition, there was a positive relationship between behavior associated with viewing weaknesses and the degree to which information was prioritized over emotion. However, in contrast with our expectations, there were no age-group differences in
reported emotion-regulation goals. Controlling for self-reported relevance of each domain did not alter the results in any of these analyses.

In this manuscript, we identified pre-existing mood as a factor for consideration in the age-related positivity effect. Results suggest that older adults may be able to use their positive mood as a resource in addressing self-relevant information that may be negative but important. In contrast with SST, we did not find evidence that young and older adults differ in their emotion-regulation goals, nor did we find that goals differed as a function of mood. Findings left one important question which we investigated in the next manuscript: Is it general mood or self-perceptions in the domain of interest (e.g., cognitive ability) that influence older adults’ willingness to attend to negative information?
Affective Influences on Older Adults’ Attention to Self-relevant Negative Information

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Original Research Report

Affective Influences on Older Adults’ Attention to Self-Relevant Negative Information

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Abstract

Objectives: Some research suggests that older adults have a tendency to be biased toward positive information, but may be more willing to attend to potentially beneficial negative information in certain situations. Following the mood-as-resource framework, one possibility is that older adults may be more willing to consider negative information when in a positive mood, with positive affect serving as a buffer to the adverse emotional consequences that may follow.

Method: Young (n = 62) and older (n = 65) adults completed a difficult cognitive task before completing either a positive or negative experience recall task, depending upon assigned condition. Afterwards, they rated their interest in viewing their strengths and weaknesses on the previously completed task, and then selected and viewed different types of feedback (i.e., strengths or weaknesses).

Results: Older adults in the positive condition selected more weaknesses to view and spent more time viewing weaknesses than older adults in the negative condition. There were no differences across conditions in behavioral results for young adults. Ratings of interest in viewing different types of feedback did not correspond with actual feedback viewing behavior.

Discussion: Results highlight the importance of considering older adults’ pre-existing mood before addressing self-relevant information that may be negative but important.

Keywords: Decision making, Emotion, Mood-as-resource, Positivity

In everyday life, people often encounter situations in which they must attend to valence information in order to solve problems. Research suggests that individuals in later adulthood tend to disproportionately focus on positive information in order to maintain a positive affective state (Carstensen & Mikels, 2005; Reed, Chan, & Mikels, 2014). Unfortunately, this focus on the positive may not always be beneficial. Negative information and emotions are important because they motivate change in behavior that might lead to dysfunctional outcomes if left ignored (e.g., Labouvie-Vief, 2003). Therefore, attending to negative information or being able to handle the experience of negative emotions is advantageous in achieving personal growth. Given that older adults are often faced with situations in which consideration of negative information is pertinent (e.g., side effects of medications; risk associated with retirement investments), gaining a better understanding of contexts that facilitate such consideration would be useful. One possibility—and the focus of this study—is that older adults may be able to utilize positive mood as a resource for the processing of negative information.

Older Adults and Emotional Goals

Socioemotional Selectivity Theory (SST; Carstensen, Isaacowitz, & Charles, 1999) posits that with aging comes a greater propensity to focus on emotional well-being due to reductions in future time perspective, resulting in older adults being more likely than younger adults to attend to...
relationships and stimuli that are more emotionally gratifying. This shift has been used to explain the "positivity effect," which refers to an age-related increase in preference for positive over negative information (Carstensen & Mikels, 2005). Importantly, positivity is not evident in all cases involving valenced information, with the effect being moderated by various situational factors. A number of studies have demonstrated that older adults do not always focus more on positive mood or stimuli (e.g., Chung, 2014; English & Carstensen, 2015; Hess, Popham, Dennis, & Emery, 2013; Knight et al., 2007; Lockenhoff & Carstensen, 2008). A recent meta-analysis (Reed et al., 2014) compared studies with and without constraints on individuals' processing, and less positivity in the former. Note, however, that there is no theoretical consistency in the nature of the processing constraints that may be responsible for these situational effects.

From both a theoretical and practical perspective, it should be a priority to further understand the conditions under which older adults pursue goals that are likely to have long-lasting positive effects, which in many cases requires attending to negative information. One possibility is that if their presumed emotional goals have already been met, older adults may be more willing to put resources toward considering negative information.

Mood as a Resource

A useful theoretical framework, mood-as-resource (e.g., Trope, Ferguson, & Raghubar, 2001), argues that positive mood may buffer the negative emotional reactions that often come with exposure to negative information. Avoiding negative information becomes unnecessary when individuals have reached an adequate level of self-esteem or positive affect (e.g., Aspinwall, 1998; Higgins, 1987; Trope & Neto, 1994; Weiner, 1986). In the absence of pre-existing issues, more resources can go toward goals such as enhancing the self or accurately assessing one's abilities. Positive mood may alter the cost-benefit ratio, that is, the assessments of the immediate costs of attending to negative information versus the long-term gains that may come as a result (Trope & Pomeranz, 1998). Moreover, it may influence appraisals of available resources for handling negative information (Schwarz & Bohner, 1996) and encourage self-improvement motivation (e.g., Fishbach, Eyal, & Finkelstein, 2010; Fishbach & Labroo, 2007) and systematic processing of self-relevant messages (Dias, Vonkeman, & Hartmann, 2012).

Positive affect, beliefs, and experiences may facilitate functioning and raise interest in viewing negative information, whereas negative states demand more resources for coping, leaving less for dealing with negative information (Trope, Igo, & Burke, 2006). Studies with younger adults suggest that mood can be used as a resource in feedback-seeking behavior (e.g., test results: Gasper & Zawadzki, 2013; Trope & Gervey, 2000; health information: Schuettler & Kwininemi, 2006). However, mood is more likely to be a goal than a resource when subject matter is not self-relevant or feedback is not diagnostic, meaningful, or helpful to the learning process (e.g., Trope & Gervey, 2000). In these types of situations, the hedonic contingency hypothesis posits that attending to negative self-relevant information may result in a costly negative shift in affect, motivating individuals to attempt to maintain positive or improve negative states (Wegener & Petty, 1994).

Mood as a Resource and Age Considerations

Some research suggests that older adults pay attention to positive stimuli in order to increase their positive affect. For example, when feeling negative, older (but not young) adults tend to gaze toward positive and away from negative stimuli (Isaacowitz, Toner, Goren, & Wilson, 2008), which may assist them in improving their mood (Isaacowitz, Toner, & Neupert, 2009). If relative to young adults, older adults have stronger chronic affective goals, potential conflicts between emotional and self-improvement goals should be exacerbated when they encounter negative self-relevant information. In such cases, older adults should be motivated to feel good and seek out positive information. However, if already feeling good, they may be willing to attend to negative information if it is self-relevant. Young adults may show a similar but weaker trend given the presumed absence of a chronic emotional goal. Alternatively, if emotional goals have primacy in later life, they may overwhelm information goals—even in self-relevant contexts when older adults are in positive moods—leading to older adults exhibiting a consistent hedonic focus (e.g., bias toward positive information).

The current study investigates age differences in information-gathering behaviors when affective goals have or have not been met. Young and older adults completed a difficult cognitive test, and then recalled memories of either previous cognitive successes or failures. By having participants focus on either positive or negative information about the self, we hoped to alter older adults' supposed tendency to focus on emotion. Participants then viewed feedback pertaining to the strengths or weaknesses on the test they completed previously.

We hypothesized that individuals in the positive condition would be more likely to select a weakness to view first, select more weaknesses to view, spend more time viewing weaknesses, and be more interested in viewing feedback about their weaknesses than those in the negative condition. We expected that, relative to young adults, older adults’ tendency to strive for positive emotional states would lead them to be disproportionately affected by a negative mood manipulation. That is, older adults might be less inclined than younger adults to view their strengths in an attempt to make themselves feel better because this is less of a chronic goal for young adults. We also examined the degree to which an increased focus on negative information in the positive condition related to a shift in the salience of information goals.
Methods

Participants
The sample comprised 62 younger adults (ages 18–28, 32 women) and 65 older adults (ages 65–89, 32 women). Ideal sample size was calculated to be 128 using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), and was based upon a medium effect size at alpha = .05 with power of .80. Younger adults were recruited from introductory psychology classes, fulfilling a course option through participation. Older adults were recruited from the Raleigh, NC, community through newspaper and on-line ads, and received a $24 honorarium. Participant characteristics are displayed in Table 1. We observed age differences in the expected directions for all demographic and cognitive measures.

Design
We used a 2 (age: young/old) x 2 (valence of recalled experience: positive/negative) between-subjects factorial design.

Materials
Cognitive task
A computerized task consisting of questions from the Everyday Cognition Battery (ECB; Allaire & Marsiske, 1999) was created for this study. This was intended to serve as a task that would be viewed as meaningful and relatively difficult to all participants, rather than a measure of ability. The ECB was divided into four subsets, based on the abilities thought to underlie performance (knowledge, inductive reasoning, declarative memory, and working memory). On each subset, we selected three questions pertaining to each of three domains (nutrition, finances, and medication), for a total of 56 questions. Each section had a practice question at the beginning to allow participants to familiarize themselves with the question formats.

Table 1. Mean (SD) Participant Characteristics

<table>
<thead>
<tr>
<th>Measure</th>
<th>Young Positive condition</th>
<th>Young Negative condition</th>
<th>Older Positive condition</th>
<th>Older Negative condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Age*</td>
<td>19.13 (1.12)</td>
<td>19.32 (1.90)</td>
<td>73.86 (6.69)</td>
<td>73.63 (5.83)</td>
</tr>
<tr>
<td>Education*</td>
<td>12.94 (0.93)</td>
<td>12.94 (0.72)</td>
<td>16.77 (2.29)</td>
<td>16.03 (2.82)</td>
</tr>
<tr>
<td>SF36 Physical health*</td>
<td>48.05 (4.35)</td>
<td>46.91 (5.19)</td>
<td>47.85 (4.78)</td>
<td>45.07 (5.86)</td>
</tr>
<tr>
<td>SF36 Mental health*</td>
<td>47.67 (9.95)</td>
<td>50.11 (2.39)</td>
<td>55.38 (6.69)</td>
<td>59.11 (4.62)</td>
</tr>
<tr>
<td>GDS*</td>
<td>2.16 (2.35)</td>
<td>2.39 (2.65)</td>
<td>1.06 (1.46)</td>
<td>1.07 (1.31)</td>
</tr>
<tr>
<td>Short Blessed*</td>
<td>1.74 (2.62)</td>
<td>1.19 (1.40)</td>
<td>2.49 (2.38)</td>
<td>2.90 (2.98)</td>
</tr>
<tr>
<td>Letter-Number Sequencing*</td>
<td>11.32 (2.46)</td>
<td>11.45 (2.84)</td>
<td>9.74 (2.16)</td>
<td>10.00 (2.27)</td>
</tr>
<tr>
<td>Digit-Symbol Substitution</td>
<td>85.13 (16.30)</td>
<td>82.61 (12.87)</td>
<td>61.62 (13.65)</td>
<td>58.69 (14.20)</td>
</tr>
<tr>
<td>Vocabulary*</td>
<td>17.82 (0.95)</td>
<td>19.98 (0.95)</td>
<td>25.45 (0.89)</td>
<td>24.83 (0.96)</td>
</tr>
<tr>
<td>Future Time Perspective*</td>
<td>5.30 (0.93)</td>
<td>5.60 (0.86)</td>
<td>4.04 (1.30)</td>
<td>4.11 (1.26)</td>
</tr>
</tbody>
</table>

Note: A 2 x 2 (Age Group x Condition) analysis of variance was performed on each measure. Values with the same superscript letters indicate significant differences between means. GDS = Geriatric Depression Scale.

*M = .05

Mood assessment
As a manipulation check, Self-Assessment Manikins (SAM; Lang, 1980) were used to capture the valence and intensity of the respondent's current mood state. SAM uses a series of manikins depicting varying degrees of valence (positive-negative) and intensity (calm-excited), and has been validated for use in both younger and older adults with acceptable internal consistency for valence (α = .63 for young adults and α = .82 for older adults) and intensity (α = .98 for both young and older adults) (Backs, da Silva, & Han, 2005).

Goal assessment
Because there is currently no scale that measures the prioritization of emotion goals versus information-seeking goals, we developed the Goal Prioritization Inventory (GPI; see Supplementary Appendix) for the current study. The scale lists eight goals and asks respondents to rate the degree to which each goal is important to them at the moment using a 7-point Likert scale. Half of the goals are related to emotion regulation and half are related to information gathering, and the scale yields a score for each. Cronbach's α for the overall scale was .75, and the subscales (Emotion Regulation and Information Gain) resulted in identical reliabilities (α = .66). These values suggest that reliability is acceptable for exploratory purposes, although further refinement of this scale may be needed if future use is desired.

Feedback matrix
Using E-Prime, a 2 (Feedback valence: Strengths, Weaknesses) x 3 (ECB domain: Nutrition, Finances, & Medication) matrix was constructed to present feedback about performance to participants. Feedback valence was labeled at the top of the matrix, and ECB domains were listed along the left side of the matrix, with the order of content in rows and columns counterbalanced across participants. After
selecting a cell to view, participants were presented with two percentile scores relating to different subtests/cognitive abilities, accompanied by two sentences about the meaning of the scores (see Figure 1). Each cell contained a set of standard positive or negative feedback to ensure that participants viewed the same information when selecting a particular cell. However, participants were under the impression that the feedback was indicative of their performance on the test.

**Procedure**

Prior to beginning the test session, participants completed a demographics form, the SF-36 health survey (Ware, 1993), Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986), and Future Time Perspective scale (FTP; Carstensen & Lang, 1996). The Short Biodied Orientation-Memory-Concentration test (Katzman et al., 1983) was administered to the older adults to screen for cognitive impairment (indicated by a score of 7 or higher).

After completing tasks for an unrelated experiment, participants were given a cognitive assessment battery, including the WAIS III Letter-Number Sequencing and Digit-Symbol Substitution tasks (Wechsler, 1997) and vocabulary test V-2 from the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Dermen, 1976). Participants then reported their current mood for the first time by completing the SAM before completing the modified ECB on the computer. To maximize self-relevance and perceived value of the task, the instructions explained that the task is diagnostic of cognitive abilities, and those who perform well in each domain are more likely to have positive future outcomes in that particular area. After completing the ECB, participants reported their current mood a second time.

Participants were randomly assigned to either a positive or negative experience prime condition, and given the following instructions, based on condition: “Think of a recent situation in which you were (un)successful in using your brain power or mental capabilities, and were particularly (dis)pleased with the result. Please spend at least 5 min writing about this situation in great detail, including information about who was involved, what the impact was on you and others, how you felt, and why you felt this way.” Participants spent a minimum of 5 min writing their responses in pen and paper, and had the option to take them home at the end of the session if they wanted to keep their responses private. Three young adults (two in the positive and one in the negative condition) and seven older adults (four in the positive and three in the negative condition) opted to keep their responses private.

Next, participants provided another mood report and completed the GSI and feedback interest questionnaire. They then viewed the feedback screen on the computer and were told that they were to select three different cells to view individually, each for an unlimited amount of time. Participants were not allowed to return to a previously viewed cell. The computer recorded which cells were selected and how long participants spent viewing each one. Participants reported mood again after receiving feedback and rated the relevance of each domain tested in the ECB in their life using a 7-point Likert scale. Finally, participants were debriefed and compensated.

**Results**

**Preliminary Analyses**

**ECB performance**

Success of our study was predicated on the cognitive task being of moderate difficulty so that participants would experience both success and failure, making the offer of receiving feedback about each seem valid. As can be seen in Table 2, this did appear to be the case, with mean scores for both age groups falling around the middle of the possible range of variation. In addition, it was important to demonstrate
Table 2. Young and Older Adults' Mean (SD) Scores on ECB Tests and Mean (SD) Ratings of Relevance of Areas Included on ECB

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Older</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECB performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge*</td>
<td>3.55 (1.25)</td>
<td>5.01 (1.51)</td>
</tr>
<tr>
<td>Reasoning*</td>
<td>4.37 (1.67)</td>
<td>3.71 (1.61)</td>
</tr>
<tr>
<td>Memory*</td>
<td>5.18 (1.78)</td>
<td>4.26 (1.51)</td>
</tr>
<tr>
<td>Working Memory*</td>
<td>7.72 (1.53)</td>
<td>5.02 (1.98)</td>
</tr>
<tr>
<td>ECB relevance ratings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Management</td>
<td>5.52 (1.53)</td>
<td>5.83 (1.65)</td>
</tr>
<tr>
<td>Medication Use*</td>
<td>3.82 (1.77)</td>
<td>5.09 (1.95)</td>
</tr>
<tr>
<td>Nutrition*</td>
<td>5.39 (1.31)</td>
<td>5.86 (1.36)</td>
</tr>
</tbody>
</table>

Note: ECB scores range between 0 and 9 with higher scores indicating better performance. Relevance ratings range between 1 and 7 with higher values indicating higher relevance. ECB = Everyday Cognition Battery.

*Age group difference significant at p < .05.

that individuals in the positive and negative conditions did not differ in their performance so that differences in task performance could not explain subsequent feedback viewing behavior. Because we had no expectations about variations in performance across the task and were more interested in between-age and condition differences, we examined ECB performance using a 2 (Age Group) × 2 (Condition) multivariate analysis of variance (MANOVA), with performance scores in each of the four ECB subtests as dependent variables. This analysis yielded only a significant effect of age group, F(4, 120) = 25.46, p < .001, η² partial = .50. Subsequent univariate ANOVAs revealed that younger adults performed significantly better—Fs(1,125) > 5.20, ps < .02—on all tests except knowledge, where the age difference was reversed, F(1,125) = 35.52, p < .001 (Table 2). Critically, there were no significant effects associated with condition (ps > .13).

Manipulation check
We next examined affective responses to see if our manipulation of mood had the intended effect. Ratings of both valence and intensity of mood were combined into a single measure at each time point by rescaling the valence scores so that 0 was the middle and scores ranged from -4 to +4, and then multiplying these values by the intensity scores (Figure 2). A 2 (Age Group) × 2 (Condition) × 4 (Time Point [time 1 vs time 2 vs time 3 vs time 4]) mixed analysis of variance (ANOVA) was then conducted on these scores. There was a significant main effect of time, F(1, 123) = 14.56, p < .001, η² partial = .11, as well as a significant interaction between condition and time, F(1, 123) = 8.44, p < .001, η² partial = .06. Follow-up univariate ANOVAs revealed a significant difference between the negative (M = 6.82, SE = 1.49) and positive (M = 11.64, SE = 1.44) conditions only at Time 3 (i.e., immediately after the manipulation), F(1, 123) = 5.41, p = .02, η² partial = .04. A significant Age × Time interaction was also observed, F(1, 123) = 4.49, p = .034, η² partial = .04, attributable to differences in initial reports of baseline mood between the two young groups. Importantly, the three-way interaction was not significant, F(1, 123) = .53, p = .66, η² partial = .004, indicating that the manipulation was not only successful, but that it had similar effects across age groups.

One potential concern is based on the fact that there was more variability in the writing content produced by younger adults than by older adults. Specifically, younger adults tended to write about academic experiences (57% and 67%), in the positive and negative conditions wrote about school-related successes and failures, respectively), whereas older adults’ writing samples were more varied in content. Nevertheless, mood ratings following the experience recall were indicative of an equally successful mood induction for all age group/condition combinations.

Relevance
Given that the importance attached to the assessment context influences the use of mood as a resource, we next examined participants' ratings of relevance (Table 2) by conducting a 2 (Age Group) × 2 (Condition) × 3 (Relevance Category) Mixed ANOVA. There was a significant main effect of age, F(3, 123) = 12.50, p = .001, η² partial = .29, as well as the quadratic function of the interaction between relevance category and age group, F(3, 123) = 6.60, p = .01, η² partial = .05, we decided to follow up with univariate ANOVAs. This revealed significant age effects in two of the three categories (Table 2). Importantly, when a mean relevance score was included in our analyses below as a covariate, it was not significant in any case, and the results were not affected by its inclusion.

Feedback-Associated Responses
Number of weaknesses viewed
We first examined participants’ specific feedback selections. We conducted a 2 (Age Group) × 2 (Condition) ANOVA on the total number of weaknesses viewed, which could range...
from zero to three. There was a significant main effect of age group, indicating that younger adults ($M = 1.86$; $SD = 0.11$) selected more weaknesses to view than did older adults ($M = 1.53$; $SD = 0.11$), $F(1,123) = 4.28$, $p < .05$, $η^2_{\text{partial}} = .03$. There was also a near-significant main effect of Condition, $F(1,123) = 3.93$, $p = .05$, $η^2_{\text{partial}} = .03$, whereby those in the positive condition ($M = 1.85$; $SD = 0.11$) tended to view more weaknesses than those in the negative condition ($M = 1.54$; $SD = 0.11$). Most importantly, there was a significant Age × Condition interaction, $F(1,123) = 4.78$, $p < .05$, $η^2_{\text{partial}} = .04$.

Further examination of this interaction through Bonferroni pairwise post-hoc comparisons revealed results consistent with expectations. Older adults in the negative condition ($M = 1.20$; $SD = 0.96$) viewed significantly fewer weaknesses than older adults in the positive condition ($M = 1.86$; $SD = 0.94$), whereas there was no difference ($p = .89$) in the number of weaknesses viewed by young adults in the positive ($M = 1.84$; $SD = 0.85$) and negative ($M = 1.87$; $SD = 0.85$) conditions. Within the negative condition, older adults viewed significantly fewer weaknesses than younger adults ($p = .004$), but the age difference was not significant in the positive condition ($p = .93$) (Figure 3A, Table 3).

First feedback selection
We next examined the number of times a weakness was chosen first during the feedback session as a function of age group and condition. Unexpectedly, there were no significant differences among the values involved in this analysis, $χ^2 (1, 127) = 1.67$, $p = .21$. Further analysis to test specific predictions revealed that whereas young adults in the positive and negative conditions did not differ in their frequency of choosing either a weakness or a strength, $χ^2 (1, 62) = .07$, $p = 1.00$, there was a significant difference between conditions among older adults, $χ^2 (1, 65) = 4.43$, $p = .04$. Specifically, 31% of older adults in the negative condition selected a weakness first compared to 63% older adults in the positive condition. In contrast, 61% of the young adults in the negative condition and 58% in the positive condition chose to view a weakness first (Figure 3B, Table 3).

Viewing time
Next, we examined attention to weaknesses by dividing the total time spent viewing weaknesses by the total viewing time for all three selections in order to control for both age and individual variability in reading speed. A 2 (Age Group) × 2 (Condition) ANOVA on these proportions revealed a main effect of condition, $F(1,123) = 5.44$, $p = .02$, $η^2_{\text{partial}} = .04$, whereby these in the positive condition ($M = 0.64$; $SD = 0.04$) spent a significantly greater proportion of time viewing weakness-related feedback than those in the negative condition ($M = 0.52$; $SD = 0.04$). There was no effect of age group, $F(1,123) = 1.97$, $p = .16$, $η^2_{\text{partial}} = .02$, but the Age × Condition interaction was significant, $F(1,123) = 6.56$, $p = .01$, $η^2_{\text{partial}} = .05$. Younger adults in the positive condition ($M = 0.61$; $SD = 0.28$) and negative condition ($M = 0.62$; $SD = 0.29$) viewed negative feedback for similar proportions of total viewing time. In contrast, older adults in the positive condition ($M = 0.67$; $SD = 0.31$) spent a significantly greater proportion of time viewing their weaknesses than did older adults in the negative condition ($M = 0.41$; $SD = 0.32$) (Figure 3C, Table 3).

Self-reported interest in viewing different types of feedback
Before participants actually selected feedback to view, they rated their interest in viewing both their strengths and their weaknesses (Table 3). We conducted a 2 (Age Group) × 2
Table 3. Mean (SD) Scores for Goal Priorities and Interest in Viewing Feedback

<table>
<thead>
<tr>
<th>Measure</th>
<th>Young Positive condition</th>
<th>Young Negative condition</th>
<th>Older Positive condition</th>
<th>Older Negative condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPI (Goal Priorities)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion subscale</td>
<td>4.93 (0.86)</td>
<td>4.90 (1.03)</td>
<td>4.95 (0.96)</td>
<td>4.69 (1.28)</td>
</tr>
<tr>
<td>Information subscale</td>
<td>5.46 (0.75)</td>
<td>5.33 (0.88)</td>
<td>5.49 (1.04)</td>
<td>5.33 (1.15)</td>
</tr>
<tr>
<td>Feedback Interest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strengths*</td>
<td>5.77 (1.45)</td>
<td>6.23 (1.02)</td>
<td>6.71 (0.57)</td>
<td>6.27 (1.44)</td>
</tr>
<tr>
<td>Weaknesses*</td>
<td>5.74 (1.51)</td>
<td>6.35 (1.11)</td>
<td>6.61 (0.73)</td>
<td>6.40 (1.19)</td>
</tr>
<tr>
<td>Feedback viewing behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of weaknesses viewed*</td>
<td>1.84 (0.85)</td>
<td>1.87 (0.85)</td>
<td>1.86 (0.94)</td>
<td>1.20 (0.96)</td>
</tr>
<tr>
<td>Probability of viewing Weakness first</td>
<td>0.58 (0.50)</td>
<td>0.61 (0.50)</td>
<td>0.62 (0.49)</td>
<td>0.37 (0.49)</td>
</tr>
<tr>
<td>Weakness view time/total view time</td>
<td>0.61 (0.28)</td>
<td>0.62 (0.29)</td>
<td>0.67 (0.31)</td>
<td>0.41 (0.32)</td>
</tr>
</tbody>
</table>

Note: Values with the same superscript letters indicate significant differences between means. GPI = Goal Prioritization Inventory.

*Age group difference significant at $p < .05$.

(Condition) $\times$ 2 (Type of feedback [strengths vs weaknesses]) repeated measures ANOVA on these ratings. The only significant finding was a main effect of age group, $F(1,123) = 5.99$, $p = .02$, $\eta^2_{partial} = .05$, indicating that older adults were overall more interested in feedback than younger adults.

Goal Prioritization

To examine whether those in the positive condition prioritized information and those in the negative condition prioritized emotion goals, we examined the mean differences in these subscores. There were no significant group or condition differences ($ps > .37$; Table 3). We then examined the relationship between goal prioritization and performance within individuals, with the expectation that prioritizing information over emotion would be positively associated with attention to negative information. To examine this, we divided the GPI information subscale score by the GPI emotion subscale score. We then calculated correlations between the resulting scores and the previously described dependent variables within each age $\times$ condition category. Significant associations were only observed for older adults in the positive condition, where positive associations with prioritizing information over emotion were obtained for both number of weaknesses viewed ($r = .43$, $p < .01$) and the proportion of time spent viewing weaknesses ($r = .40$, $p < .05$).

Discussion

The present study was designed to identify conditions under which older adults willingly consider negative information in a self-relevant context. Based on the mood-as-resource perspective, we primed individuals to feel good or bad about their cognitive abilities, and then had them view positive or negative feedback about a previously completed test. Behavioral results suggested that compared with the young adults, older adults more effectively used positive mood as a resource, or were more affected by being in a negative mood. Specifically, older adults in the negative condition viewed fewer weaknesses, were less likely to view a weakness first, and spent less time viewing weaknesses than older adults in the positive condition, as well as both groups of young adults. There were no differences in these behaviors between young adults in the positive and negative conditions. The pattern of results suggests that a negative mood state may have greater implications for older than younger adults, in line with the idea that older adults tend to prioritize mood repair.

Unexpectedly, and in contrast with previous studies, reports of interest in feedback, which occurred prior to receipt of feedback, were not related to our manipulation. Furthermore, feedback interest was not in agreement with actual viewing behaviors. Older adults reported more interest in all types of feedback, compared with young adults, with ratings of interest near ceiling. The lack of congruency in the effects associated with self-reported preferences and actual viewing behaviors is in contrast with some of the previous research using mood-as-resource and suggests that further investigation of the relationship between interest and behavior is necessary. Previous research has not always investigated behavior that would occur after receipt of feedback (e.g., Greve, Iacono, & Trope, 2005; Study 3; Schuetter & Kiviniemi, 2006), and one study that did investigate both interest and behaviors found a correlation (Greve et al., 2005, Study 1). Here, we argue that interest ratings may have limited validity in terms of predicting actual behavior. However, we acknowledge that interest is different from intention. Additionally, we may have found less of a discrepancy between interest and behavior if participants were allowed to view an unlimited number of feedback cells, but limiting choices allowed us to achieve our goal of examining prioritization of information. At the very least, our findings point to the importance of assessing
behavioral outcomes in testing the validity of a framework such as mood-as-resource.

With respect to hypothesized changes in goal orientations proposed by SST, we obtained little support for the operation of associated mechanisms in our study. We had hypothesized that older adults would be able to use positive mood as a resource, and that this would happen because their presumed chronic affective goal would be satisfied by the positive experience recall task. However, we did not find any evidence that their goals changed as a function of condition and in concert with evidence of positivity. Furthermore, there were no differences between young and older adults regarding goal priorities, suggesting that they had similar amounts of emotional resources available. Relatedly, there was also no evidence that mood itself was associated with our experimental conditions was associated with the obtained effects.

We also looked at relevance as a potential factor in explaining the results of the present study. The mood-as-resource framework suggests that individuals will most likely use positive mood as a resource in dealing with negative information when it is particularly relevant (e.g., Raghunathan & Trope, 2002), and previous research in the area of SST suggests that the positivity effect in older adults should be diminished in situations where relevance is high (e.g., Engisch & Carstensen, 2015). However, self-reported relevance was not associated with feedback seeking behavior in either young or older adults, nor did controlling for this factor alter the obtained age effects.

These null findings suggest that there is perhaps a different mechanism other than mood or mood-related goals that is responsible for the effects of the positive and negative primes found in older adults. One possibility is that the nature of the discrete emotions brought about by the mood manipulation varied across age groups. Recalling a cognitive failure may bring about feelings of fear and anxiety specifically in older adults, for whom concerns regarding dementia may be salient. It is also possible that the mechanism through which individuals use mood as a resource is something that cannot easily be self-reported, and therefore behavioral results are the most suggestive of the process. There is unfortunately a lack of specificity regarding mechanisms in the mood-as-resource framework.

Compensatory or defensive self-enhancement theory offers an additional line of reasoning to explain our findings. This theory suggests that people with generally negative views of themselves should be motivated to seek out self-enhancing, positive feedback (Hull, 1943). Furthermore, whether or not people self-enhance may depend upon their self-concept within the particular domain being examined (e.g., Swann, Krull, & Pelham, 1989). In the present study, which examined self-concept in the domain of cognitive ability, we might assume that older adults have a more negative view of their cognitive abilities than younger adults, and therefore would be more likely to behave so as to self-enhance. Our negative manipulation may have exaggerated older adults’ pre-existing negative self-concept of their cognitive abilities, whereas our positive manipulation may have led to improvements in this area of their self-concept. The lack of condition effects for young adults may be attributed to a strong pre-existing positive self-concept in the domain of cognitive ability.

A number of caveats should be considered in the interpretation of the present study’s results. One limitation is that we did not include an explicit measure of whether or not participants viewed the feedback as meaningful or diagnostic of abilities. Participants were told that performance on the ECB was indicative of everyday problem-solving abilities, but were not explicitly asked about their perception of the value of receiving feedback. Thus, while we were able to control for self-reported relevance of the specific topics covered on the ECB, we were not able to control for perception of the feedback’s value.

A major concern of ours is the vagueness with which the focus of the Mood-as-Resource framework has been defined in the literature. The data seem to suggest that a general positive state (which may include high self-esteem, ego strength, and control beliefs along with positive mood) serves as a resource in past studies as well as in ours, but the absence of associations between mood and behavior suggest that mood itself is not the driving force. In our study, we suggest that mood may be a byproduct of the way that people feel about themselves, and that any covariation observed in mood and behavior is epiphenomenal. We believe that the connectedness of our manipulation to the outcome measure (i.e., both pertained to the participant’s cognitive skills) is a strength of our study, as it allows for us to imagine a real-world application in which exposure to initial positive ideas/information leads to more willingness to explore the topic in greater depth. However, we also acknowledge that many real-world situations involve emotional experiences followed by information gathering that is unrelated to the mood elicitor. For example, prior to receiving test results, a person might listen to sad or happy music, have an argument with a family member, or attend an exciting event. It would be important to consider whether the mood-eliciting events could affect subsequent receipt of seemingly unrelated information independent of changes in feelings about self. Future research may investigate the effect of a more traditional mood induction, including a neutral condition, on information gathering behavior in older adults to further test our hypothesis that mood enhancement by itself may not be sufficient to induce the types of behavior patterns observed in our study.

In conclusion, our results indicate that preferences for viewing valenced information are dependent on older adults’ affective states, with willingness to view negative information enhanced by positive mood. More research is needed to further identify the mechanisms through which positive primes make individuals more willing to attend to negative information. However, the results of this study have potentially important implication for situations in
which older adults' functioning would be enhanced through consideration of negative information. For example, being in a positive mood might increase the probability that older adults will systematically process potentially important negative information, such as risk factors associated with medications or treatments. From a theoretical standpoint, the results also add to a growing literature suggesting that positivity biases in older adults are moderated by situational factors, with the current study demonstrating that affective state is important in influencing the processing of self-relevant valenced information.

**Supplementary Material**

Supplementary data is available at The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences online.

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**Conflict of Interest**

None reported.

**References**


Ware, J. E., Jr. (1993). *SF-36 Health Survey*. Boston: The Health Institute, New England Medical Center.


Manuscript 2: The influence of mood versus relevant self-perceptions in older adults’ interest in negative health-related information

The second manuscript follows up on the findings to the first manuscript in an effort to disentangle the influence of mood and self-perceptions in the domain of interest, further explore goal priorities as an underlying mechanism associated with mood-as-resource, and see if findings replicate in another domain: health. Based on our lack of findings associated with mood reports in the first manuscript, we hypothesized that the operative mechanism associated with positive mood serving as a resource was based in the individual’s positive self-perceptions in that domain or situation rather than people just experiencing positive affective states.

In Study 1, 201 young (age 20-40) and 196 older adults (age 65-80) were recruited through Amazon’s Mechanical Turk (MTurk) and were randomly placed into one of four conditions. They either completed a traditional positive or negative mood manipulation task, or a health behavior perception manipulation task designed to accentuate positive or negative perceptions of one’s health-related behaviors. The latter task consisted of a checklist of health behaviors that are either healthy/common and unhealthy/uncommon (intended to induce positive perceptions of health behaviors) or healthy/uncommon and unhealthy/common (intended to induce negative perceptions of health behaviors). After completing the GPI (Growney & Hess, 2017), participants selected three of six health-related articles to read based on their headlines, half of which were positively worded and half of which were negative, but offered self-corrective information. Participants reported their mood at various points throughout the study.

Consistent with our hypothesis, those in the positive health condition selected more negative health-related articles to read than those in the negative health condition, with the effect being specific to older adults. Self-reported mood had no effect on article selection, replicating
findings from the first manuscript and supporting our hypothesis that older adults used their positive self-perceptions as a resource for considering negative information. In addition, endorsement of information-gathering goals mediated the relationship between manipulated health checklist scores and article selections for both young and older adults.

In study 2, we followed the same procedure described in the health behavior perception manipulation conditions in study 1, with three modifications. First, we added a manipulation check to confirm that participants’ self-perceptions in the domain of health behaviors were influenced by our task, rather than using health checklist scores as indicators of actual perceptions, as in study 1. Second, half of the participants selected from headlines that were high in informativeness, and half from those that were low in informativeness to address the possibility that headline valence and informativeness were confounded in study 1. Third, we modified our GPI so that it specifically asked about emotion regulation and information-gathering goals as they relate to health information. Participants were a new sample of 199 older adults (age 65-86) recruited through MTurk.

Older adults in the positive health behavior perception condition selected more negative health-related articles to read than those in the negative health behavior perception condition in situations where the article headlines were highly informative. There were no differences associated with article selection in situations where the health-related articles were low in informativeness, which is consistent with the qualifications of the mood-as-resource perspective that mood will only serve as a resource when the information to-be-gathered is viewed as valuable. We also found that information-goal priorities (specifically relating to gathering health-related information) mediated the relationship between health behavior perceptions, as indicated by the newly added manipulation check, and article selection.
Overall, the findings presented in the second manuscript suggest that the mood-as-resource framework may be somewhat of a misnomer, with mood itself not serving directly as a resource influencing behavior. Rather, it seems as though a mood-based resource, such as self-perceptions in the domain of interest, may be responsible. We concluded that such self-perceptions were associated with goals relating to gathering information, which in turn were associated with interest in reading negative, but informative, articles. Thus, older adults’ information gathering goals and willingness to focus on negative self-relevant information may be bolstered by enhancing self-perceptions of self within the domain of interest.

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The Influence of Mood Versus Relevant Self-Perceptions in Older Adults’ Interest in Negative Health-Related Information

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Psychology and Aging

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CITATION
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Claire M. Grownwy and Thomas M. Hess
North Carolina State University

Past research suggests that, although older adults may tend to prefer positive over negative information, they may be more willing to consider relevant negative information when in a positive affective state (Grownwy & Hess, 2017). However, the underlying mechanism involved in this phenomenon is unclear. In the present study, we aimed to identify this mechanism and disentangle mood and self-perceptions as potential personal resources. In Study 1, young and older adults completed either a positive or negative mood manipulation task, or a health manipulation task designed to accentuate positive or negative perceptions of one’s health-related behaviors. Participants then selected three of six health-related articles to read based on their headlines, half of which were positively worded and half of which were negative, but offered self-corrective information. Participants in the positive health condition selected more negative health-related articles to read than those in the negative health condition, with the effect being specific to older adults. Simple manipulations of mood had no effect on article selection, suggesting that older adults used their positive self-perceptions as a resource for considering negative information. In addition, endorsement of information goals mediated the relationship between manipulated health behavior perceptions and article selections for both young and older adults. Results from Study 2 demonstrate that effects are specific to situations with high-informative versus low-informative content. Our findings suggest that older adults’ willingness to focus on negative self-relevant information is bolstered by enhancing self-perceptions of self within the domain of interest.

Keywords: emotion, positivity, health, mood-as-resource, decision-making

In health contexts, people face situations in which they must attend to valenced information to make informed decisions. For example, one must consider both the benefits and risks of undergoing a surgical procedure or the benefits and side effects of taking a prescription drug. Older adults, who experience more health concerns as they age, are likely to encounter these types of situations, but may be less inclined to attend to the negative pieces of information than the positive. A body of research posits that older adults tend to disproportionately focus on positive information in service of emotional goals focused on promoting well-being (Carstensen & Mikels, 2005; Reed, Chan, & Mikels, 2014). However, this focus on the positive may not always be beneficial when making medical decisions that require greater perspective. Older adults tend to make more immediate medical decisions and seek less medical information than younger adults, likely due to their limited cognitive resources, greater experience, and cohort-specific views about patient-doctor interactions (e.g., Meyer, Talbot, & Ranalli, 2007). Furthermore, physicians may be sparing with patient education for older adults, as they tend to be more accepting of physicians’ opinions (e.g., Maly, Leake, & Silliman, 2003). However, uninform, rushed decisions do not help individuals cope with a diagnosis (e.g., Berg et al., 2008). An important goal is to identify conditions under which older adults may be more willing to consider negative, but important, health-related information. In the present study, we explore the possibility that being in a positive mood or feeling good about one’s health may help older adults focus more on negative health-related information.

Regardless of age, individuals with negative views of themselves may be more likely to seek out positive feedback than those with positive views of themselves in an effort to compensate for their preexisting negative self-perception (e.g., self-enhancement theory; Taylor & Brown, 1988). Furthermore, individuals may be more likely to self-enhance in situations where their self-concept is low (e.g., Swann, Pelham, & Krull, 1989). These ideas may be particularly consequential for older adults, as declining self-perceptions of health as one ages are often coupled with increasing need for attention to health-related information that may be difficult to handle. Maintenance of physical health has been identified as a crucial component of successful aging (Schulz & Heckhausen, 1996), but may be perceived as less attainable as resources and
opportunities become depleted. The lines-of-defense model (Heckhausen, Wrosch, & Schulz, 2013) suggests that older adults’ perception of a goal’s attainability influences whether or not they choose to engage resources in pursuit of the goal. Perceived successes and failures may contribute to perceptions of goal attainability. In the context of health, perceiving success in one area may lead older adults to mobilize efforts and gather information that may be difficult to handle initially, but helpful in terms of maintaining or improving health in the long term. Conversely, if older adults perceive that goals are unattainable, they may engage in downward comparisons or focus on self-affirming information.

Socioemotional selectivity theory (SST; Carstensen, Isaacowitz, & Charles, 1999) offers another viewpoint, suggesting that aging involves changes in one’s future time perspective, leading to an increase in focus on emotional well-being, coupled with a decrease in focus on gathering new information. As a result, older adults are often more likely that younger adults to attend to stimuli that are emotionally gratifying, resulting in disproportionate attention to positive relative to negative information when compared with young adults (Carstensen & Mikesel, 2005). However, the positivity effect is not evident in all cases involving valenced information, with the effect being dependent upon various situational factors (e.g., Chung, 2010; English & Carstensen, 2015; Hess, Popham-Dennis, & Emery, 2013; Knight et al., 2007; Lockenhoff & Carstensen, 2008; Reed et al., 2014). In general, the positivity effect is more commonly identified in situations where there are no or few constraints on processing. For example, when not given specific instructions about how to gather information about doctors and health care plans, older adults attended to and remembered a greater proportion of positive versus negative information than young adults, but age differences were ameliorated when information gathering goals were activated (Lockenhoff & Carstensen, 2007). A few studies have explored the positivity effect as it relates to positively and negatively framed health care messages, finding evidence to suggest that older adults prefer and have better memory for positive versus negative messages (Shamaskin, Mikesel, & Reed, 2010), and are more likely to respond with healthy behavior in response to a positive message (i.e., walking; Notthoff & Carstensen, 2014). Unfortunately, not all negative health-related information can be easily framed in a positive manner. Specifically, valence of information often aligns with helpfulness such that negative health-related information is the most helpful and informative to the decision-making process, but also places the most demands on affective resources. Additionally, individuals are usually not given specific instructions about how to gather and process information. Thus, in the present study, we aimed to distinguish a context in which older adults might be most willing to attend to negative, but helpful health-related information. To this end, we attempted to activate information gathering goals without overtly instructing participants to gather information using a specific strategy.

In a previous study (Grawney & Hess, 2017), we examined the possibility that affective states might influence older adults’ willingness to focus on negative, self-relevant information. Using the mood-as-resource perspective as a backdrop (e.g., Trope, Ferguson, & Raghunathan, 2001), we tested whether being in a positive mood would make older adults more willing to expose themselves to negative information. Relative to being in a negative mood, we reasoned that older adults in a positive mood may be less focused on improving their emotional state, and more open to learning about one’s personal weaknesses and being exposed to negative about oneself. To test this, we primed individuals to feel good or bad about their cognitive abilities, and then allowed them to choose to view positive or negative feedback about a previously completed test. Compared with the young adults, older adults appeared to more effectively use positive mood as a resource. Specifically, older adults in the negative condition viewed fewer weaknesses, were less likely to view a weakness first, and spent less time viewing weaknesses than older adults in the positive condition. There were no differences in these behaviors between young adults in the positive and negative conditions. We concluded that a negative mood state may have greater implications for older than younger adults, in line with the idea that older adults tend to prioritize mood repair. Of further interest, older adults experiencing a positive emotional state did not exhibit a bias toward positive information to regulate and maintain their current emotional state, a finding seemingly in contradiction to expectations drawn from SST.

Based on these results, we decided to conduct additional research to address several important empirical and theoretical issues. First, we were interested in seeing if the effects observed in our first study generalized to a different context having to do with health-related behaviors. Second, given the apparent inconsistency of our findings with both (a) expectations derived from SST and (b) empirical results from studies with younger adults (e.g., Gasper & Zawadzki, 2013; Gervey, Isgo, & Trope, 2005; Schuettel & Kiviniemi, 2006), we were interested in replicating the previously observed pattern of age effects and examining the expected effects in relation to goal orientations. Finally, we wanted to explore the mechanisms involved in any observed effects. Relevant to this last goal, although we used the mood as resource perspective to guide our research, it is unclear whether the resource undergirding the willingness to entertain negative information about self is an actual affective state versus mood-related ego strength associated with a specific context.

Study 1

Our first study addresses these issues by investigating age differences in information-gathering associated with health-related behaviors under conditions designed to induce either positive versus negative global affective states or positive versus negative self-perceptions in the domain of health. Participants in each condition then viewed a list of article headlines presenting health issues in a positive or negative light, from which they selected a subset of the associated articles to read. Importantly, it was clear from the headlines that the reader would learn more valuable information (e.g., self-corrective) from the negative articles than the positive articles. We hypothesized that individuals in the positive conditions would select more negative articles to view than those in the negative condition, but we also predicted that manipulating health behavior perceptions would more strongly influence interest in negative health-related information than simply manipulating mood. We reasoned that positive perceptions of self within the domain of interest would bolster ego strength and thus make individuals more willing to consider potentially negative self-relevant information when compared to those individuals in the condition promoting negative perceptions of health. We also pre-
dicted that this bolstering effect would be greater than that which would occur through a simple bolstering of mood. Additionally, and consistent with our previous findings, we expected that, relative to young adults, older adults' tendency to strive for positive emotional states would lead them to be disproportionately affected by the negative manipulation of health behavior perceptions. Relevant to this last prediction, we also explored the possibility that the impact of the health-based manipulation would have its impact on behavior through changes in goal orientation associated with affective or information-seeking goals.

**Method**

All procedures were approved by North Carolina State University's institutional review board.

**Participants.** Individuals were recruited through Amazon's Mechanical Turk (MTurk), with selection criteria specifying that only those living in the United States with at least a 95% approval rating from requesters on other tasks they completed could participate. Participants were 201 younger adults aged 20–40 years and 196 older adults aged 65–80 years. Participant characteristics are displayed in Table 1. Typical of most research on aging, younger adults reported better physical health and fewer chronic conditions than older adults, whereas older adults reported better mental health than younger adults. However, there were no significant differences in depression scores between young and older adults. The age groups did not differ in education levels. Importantly, there were no significant differences associated with our experimental conditions for any of the characteristics displayed in the table. Participants received $2.00 for their efforts and time, which is considered average-generous for MTurk studies of similar length and effort requirements.

**Design.** We used a 2 (Age Group: young vs. old) x 2 (Manipulation Type: traditional mood manipulation vs. health perspective manipulation) x 2 (Valence of Manipulation: positive vs. negative) between-subjects factorial design.

**Materials.**

**Traditional mood manipulation task.** Twenty-four images from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) that contained people were used for the traditional mood manipulation. We selected 12 positive (M_valence = 7.39 [SD = 1.62]; M_negval = 5.07 [SD = 2.23]) and 12 negative images (M_valence = -2.92 [SD = 1.74]; M_negval = -5.38 [SD = 2.16]) based on ratings from the IAPS norms for use in respective conditions. Positive and negative images did not differ significantly in arousal.

**Health behavior perception manipulation task.** We designed two different checklists for purposes of influencing self-perceptions of health behaviors (see Table 2). The checklist in the negative condition was intended to make respondents feel as though they engaged in many unhealthy behaviors and few healthy ones. It included six behaviors that many people do, but are seen as negative, along with six behaviors that are less common, but seen as positive. In contrast, the checklist in the positive condition was designed to do the opposite, and included six positive behaviors that many people do, as well as six negative behaviors that we expected most people would not endorse. The checklists were designed so that most people would endorse the negative behaviors but not the positive behaviors as being typical for them on the negative checklist, whereas the opposite would be expected for the positive checklist. Presentation order of the items on the checklists was randomized.

**Goal assessment.** To measure the prioritization of emotion goals versus information-seeking goals, we used the Goal Prioritization Inventory (GPI), which we developed and used in a previous study (Grunwalt & Hess, 2017). The scale lists eight goal-related statements, four of which are related to emotion regulation and four of which are related to information gathering (see Table 3). To assess state-specific goals, participants were asked to indicate the extent to which each statement matches how they were feeling at that moment, with 1 indicating that the statement was not at all descriptive of their current feelings and 7 indicating that the statement was very descriptive of their current feelings. To validate the two-factor structure of this scale, we conducted a factor analysis using principal-axis factoring with a varimax rotation. We found a two-factor solution, with items loading on to each subscale as expected (see Table 3). The first factor (i.e., information gathering) explained 38.3% of the total variance, whereas the second factor (i.e., emotion regulation) explained an additional 16.3% of variance. Due to some cross-loadings for two of the items on the scale, we decided to use factor scores as indicators of goal priorities in our analyses.

**Information articles.** A set of six articles served as a means for determining interest in health-related information. This set contained two articles from each of the following topics: physical activity, nutrition, and sleep. Importantly, these are the three topics covered on the health checklist. For each topic, one of the six articles presented the topic in a more “positive” way, suggesting that the reader is probably already doing well in that particular area, and the other article presented the topic in a more “negative” but realistic way, suggesting that the reader would learn something about how to change unhealthy habits. Importantly, the negative headlines were intentionally more informative than the positive headlines, as it is often the case in health contexts that information that may be difficult to handle is the most informative or prescriptive. Participants read, “We would like to know what types of articles interest you. Please read the following list of article headlines, and select three to read.” Thus, interest in the negative articles was operationalized by the number of negative articles selected. Headlines are displayed in Table 4.

**Additional measures.** The SF-8 Health Survey (Ware, 2001) was used to measure self-rated physical and mental health assessed over the previous four weeks. The SF-8 includes eight items which each represent a subscale on longer versions of the measure: General Health, Physical Functioning, Role Physical, Bodily Pain, Vitality, Social Functioning, Mental Health, and Role Emotional. Participants read, “We would like to know about your views on your health. Respond to each question by selecting the answer as indicated” and then responded to items on 5- or 6-point scales with varying labels. For example, responses to the General Health item “Overall, how would you rate your health during the past 4 weeks?” could range from “excellent” to “very poor,” whereas responses to the Physical Functioning item, “During the past 4 weeks, how

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1 IAPS pictures used in each category—negative: 2691, 6212, 6244, 6131, 6530, 6840, 2053, 2205, 2766, 2312, 2000, 2410; positive: 2165, 2216, 2360, 2395, 2530, 2560, 8497, 8116, 8730, 8380, 8461, 8490.
Table 1
Mean (SD) Participant Characteristics of Young and Older Adults in Study 1 and Older Adults in Study 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study 1</th>
<th>Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Young</td>
<td>Older</td>
</tr>
<tr>
<td>Sex</td>
<td>201</td>
<td>196</td>
</tr>
<tr>
<td>% Females*</td>
<td>42.8%</td>
<td>60.2%</td>
</tr>
<tr>
<td>Age*</td>
<td>30.66 (5.10)</td>
<td>68.66 (3.96)</td>
</tr>
<tr>
<td>Years of education</td>
<td>15.06 (2.36)</td>
<td>15.38 (2.57)</td>
</tr>
<tr>
<td>SF-3 Physical Health*</td>
<td>51.77 (7.16)</td>
<td>46.74 (9.09)</td>
</tr>
<tr>
<td>SF-3 Mental Health*</td>
<td>46.47 (11.20)</td>
<td>50.07 (9.18)</td>
</tr>
<tr>
<td>Number of chronic conditions*</td>
<td>1.58 (1.20)</td>
<td>2.93 (2.32)</td>
</tr>
<tr>
<td>Geriatric Depression Scale</td>
<td>2.70 (1.42)</td>
<td>2.84 (1.34)</td>
</tr>
</tbody>
</table>

Note. For Study 1, a 2 (Age Group) × 2 (Valence Condition) × 2 (Manipulation Type) analysis of variance was performed on each measure. Across analyses, there were only significant effects of age group. For Study 2, a 2 (Valence Condition) × 2 (Headline Informativeness) analysis of variance was performed on each measure, with no significant effects. *Study 1 age group difference significant at p < .05.

much did physical health problems limit your physical activities (such as walking or climbing stairs)?” could range from “not at all” to “could not do physical activities.” Scores derived from each of the eight items were used in calculating both the Physical and Mental subscale, with certain items factoring into one subscale more than the other. For more specific information about calculating the subscales, please refer to the SF-8 health survey handbook (Ware, 2001).

The Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986) was used to measure depressive symptoms and had strong internal consistency in the present study (α = .85). Lastly, we used a chronic conditions checklist based on the one used in the Midlife in the United States study (Marmot, Ryff, Bumpass, Shipley, & Marks, 1997) to measure the number of health issues participants were facing at the time of report. Our measure of chronic conditions asked, “Have you been diagnosed with and are currently experiencing any of the following chronic illnesses or disorders?” and listed 29 items such as thyroid disease, hay fever, gall bladder trouble, and persistent skin trouble. There was also an option to check “other” and list a condition not included on the list.

Procedure. After agreeing to participate and electronically signing the informed consent, participants filled out a short demographics survey to determine eligibility for participation. The questions asked for their age in years, sex, and years of education. Those who reported being outside of our desired age ranges (i.e., 20–40; 65–85) were directed to the end of the survey and informed that they were not eligible to participate. To ensure that participants were truthful about their ages, we did not inform them of our specific eligibility criteria. Additionally, we included a question halfway through the study asking for the respondent’s

Table 2
Positive and Negative Health Checklists

<table>
<thead>
<tr>
<th>Positive health checklist</th>
<th>Negative health checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try to eat at least 1 fruit or vegetable every day. (+, n)</td>
<td>I monitor my calorie intake and am certain that I get the recommended amount of calories in a day. (+, n)</td>
</tr>
<tr>
<td>When I have sweets, I usually try not to overindulge. (+, +e)</td>
<td>I get at least six servings of fruit and vegetables daily. (+, n)</td>
</tr>
<tr>
<td>I am physically fit enough to do most or all daily tasks without assistance. (+, +e)</td>
<td>I get a good mix of cardio and strength training every day. (+, +e)</td>
</tr>
<tr>
<td>Sometimes take walks or do other activities to get exercise. (+, +e)</td>
<td>I exercise for at least 90 min every day. (+, +e)</td>
</tr>
<tr>
<td>I try to follow a regular sleep schedule. (+, s)</td>
<td>I never have difficulty falling asleep at night. (+, +s)</td>
</tr>
<tr>
<td>I get enough sleep for me to function well most or all days. (+, s)</td>
<td>I always wake up feeling full of energy. (+, +s)</td>
</tr>
<tr>
<td>I eat a large dessert on most days. (−, −n)</td>
<td>I sometimes eat more than the recommended serving size when snacking. (−, −n)</td>
</tr>
<tr>
<td>I find healthy food unappealing and as a result I eat it rarely. (−, −n)</td>
<td>I sometimes indulge in sweets that I enjoy even though they are not healthy. (−, −n)</td>
</tr>
<tr>
<td>I tend to have difficulty walking around the block. (−, −e)</td>
<td>Sometimes I don’t follow through with my intentions to exercise. (−, −e)</td>
</tr>
<tr>
<td>I am sedentary for most of the time on most days. (−, −e)</td>
<td>My physical fitness is not as good as it used to be. (−, −e)</td>
</tr>
<tr>
<td>I need to drink five or more cups of coffee a day in order to not feel drowsy. (−, −s)</td>
<td>I don’t always get the amount of sleep I need to function well. (−, −s)</td>
</tr>
<tr>
<td>After getting into bed, it usually takes me longer than 2 hr to fall asleep. (−, −s)</td>
<td>Sometimes I have restless nights of sleep. (−, −s)</td>
</tr>
</tbody>
</table>

Note. Both checklists included two positive (+) and two negative (−) items from the categories of nutrition (n), exercise (e), and sleep habits (s). On the positive checklist, positive items were “likely” and negative items were “unlikely,” with the opposite being true for the negative checklist. Items were listed in a randomized order.
Table 3
Factor Loadings for Goal Prioritization Inventory

<table>
<thead>
<tr>
<th>Item or scale: Study 1: “I would like to...” Study 2: “When gathering information about health, I would like to...”</th>
<th>Study 1 Information subscale (Factor 1)</th>
<th>Study 1 Emotion subscale (Factor 2)</th>
<th>Study 2 Information subscale (Factor 1)</th>
<th>Study 2 Emotion subscale (Factor 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>... gain more knowledge.</td>
<td>.76</td>
<td>.09</td>
<td>.85</td>
<td>.02</td>
</tr>
<tr>
<td>... learn more about new things that benefit me.</td>
<td>.80</td>
<td>.18</td>
<td>.84</td>
<td>.02</td>
</tr>
<tr>
<td>... know how I can improve myself.</td>
<td>.67</td>
<td>.43</td>
<td>.81</td>
<td>.05</td>
</tr>
<tr>
<td>... avoid situations where I have little to learn.</td>
<td>.39</td>
<td>.18</td>
<td>.37</td>
<td>.17</td>
</tr>
<tr>
<td>... focus on things that make me feel happy.</td>
<td>.19</td>
<td>.47</td>
<td>.17</td>
<td>.42</td>
</tr>
<tr>
<td>... prevent myself from feeling bad.</td>
<td>.18</td>
<td>.58</td>
<td>.29</td>
<td>.34</td>
</tr>
<tr>
<td>... focus on my feelings and emotions.</td>
<td>.18</td>
<td>.52</td>
<td>.08</td>
<td>.85</td>
</tr>
<tr>
<td>... improve my mood.</td>
<td>.09</td>
<td>.58</td>
<td>.01</td>
<td>.68</td>
</tr>
</tbody>
</table>

Note. Factor scores were derived from a principal axis factoring analysis with varimax rotation.

date of birth so that we could verify that it corresponded with the previously reported age. Reported birth dates corresponded with reported ages for all participants who completed the study. After eligibility was determined, participants indicated the valence and intensity of their current mood on a 9-point Likert scale from negative to positive and calm to excited, respectively.

Participants were randomly assigned to one of four conditions, and accordingly either rated negative IAPS images, rated positive IAPS images, filled out a positive health checklist, or filled out a negative health checklist. In the image rating task, participants read, “On will now see a series of images. We are interested in your perceptions of the emotions in each image. Please rate the valence and intensity of the emotion depicted in each image.” They then viewed each image individually on the screen and then provided these ratings using 7-point scales ranging from 1 (negative) to 7 (positive) and 1 (calm) to 7 (intense), respectively. In the health checklist task, participants read, “We are interested in whether you engage in different types of healthy and unhealthy behaviors. Please read each item on this list and think about whether it generally describes you.” After this task, they reported their mood a second time in the same way as before, and then filled out the GFI. Participants then viewed the article list and selected three to read. Although they did not actually read articles as a part of this study, they were under the impression that they would be reading the articles after selecting them. Participants then reported their mood a third and final time to see whether intent to read certain types of articles might influence mood.

Next, participants provided additional background information, including their date of birth to validate previously reported age in years. They then filled out the Geriatric Depression Scale, SF-8, and chronic condition checklist. An attention check question was embedded in the SF-8, asking that participants select a specific

Table 4
Article Headlines in Study 1 and Study 2

<table>
<thead>
<tr>
<th>Positive headlines</th>
<th>Negative headlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>Study 2: Low-informative headlines</td>
</tr>
<tr>
<td>Super-foods for Super-agers: Hidden nutrients in 10 foods you’re probably already eating (s)</td>
<td>Older adults can eat their favorite foods and still be healthy (n)</td>
</tr>
<tr>
<td>New studies suggest older adults are getting physical activity without realizing it: Simple exercises you are probably already doing every day (c)</td>
<td>Many older adults not getting enough calcium and vitamin D to maintain bone strength (n)</td>
</tr>
<tr>
<td>Researchers say varied sleep patterns are normal part of aging (s)</td>
<td>Most Americans above age 50 fail to attain recommended levels of exercise (e)</td>
</tr>
<tr>
<td>Study 2: High-informative headlines</td>
<td>Study shows many older adults have difficulty falling asleep (s)</td>
</tr>
<tr>
<td>Older adults can eat their favorite foods and still be healthy: Easy ways to modify your favorite comfort foods to be healthier (n)</td>
<td>Many older adults not getting enough calcium and vitamin D to maintain bone strength: Bone-health foods missing from your grocery list (n)</td>
</tr>
<tr>
<td>Many older adults enjoy numerous health benefits from following a regular sleep schedule (s)</td>
<td>Most Americans above age 50 fail to attain recommended levels of exercise: Exercise advice from personal trainers (e)</td>
</tr>
<tr>
<td>Study 2: High-informative headlines</td>
<td>Study shows many older adults have difficulty falling asleep: Advice from the American Sleep Association (s)</td>
</tr>
</tbody>
</table>

Note. Article lists included one positive and one negative item from the categories of nutrition (n), exercise (e), and sleep habits (s).
response. All participants passed this attention check. Finally, participants were presented with a debriefing screen and a code to receive compensation through MTurk.

Results and Discussion

Manipulation checks.

Responses to stimulus materials. Our first manipulation check was to determine that participant responses to the images and health checklist were as intended. For the traditional mood manipulation, we examined participants' ratings of the images they viewed. To do so, we combined the raw valence and intensity scores given to each image into a single measure by transforming the original valence scores of 1 to 7 to a scale of −3 to +3, and then multiplying these values by the raw intensity scores. Mean ratings for the 12 images viewed by each participant (see Table 5) were then examined using a 2 (Age Group) × 2 (Valence Condition) analysis of variance (ANOVA).² Consistent with our intentions, ratings of images in the negative condition (M = −11.22; SD = 4.46) were significantly more negative than those in the positive condition (M = 10.30; SD = 3.78), F(1, 194) = 1,450.34, p < .001, η² = .44. There was no main effect of age group, but the Age Group × Valence Condition interaction was significant, F(1, 194) = 17.43, p < .001, η² = .08, due to the difference in ratings between conditions being somewhat greater in the old group.

To determine whether participants in the health checklist conditions completed the positive and negative lists as expected, we coded each negative item checked as −1 and each positive item as 1, with unchecked items assigned 0. We then calculated the sum of all 12 items, creating health scores that could range from −12 to +12. A 2 (Age Group) × 2 (Valence Condition) ANOVA revealed that scores in the negative condition (M = −3.17; SD = 2.47) were significantly lower than those in the positive condition (M = 3.93; SD = 1.85), F(1, 195) = 523.29, p < .001, η² = .73. No other effects were significant (ps > .34). Taken together, these two sets of results indicate that participants were responding to the mood and health manipulation stimuli as intended, with similar patterns of responses across age groups.

Self-ratings. We next examined whether participants' subjective responses varied as intended in response to our experimental manipulations. We first examined mood ratings at three assessment points to see if our mood manipulation had the intended effect and to determine if the effect was specific to the traditional mood manipulation. As with the picture ratings, we transformed the valence scores to a scale of −4 to +4, and then multiplied these values by the raw intensity scores. We conducted a 2 (Age Group) × 2 (Valence Condition) × 2 (Manipulation Type) × 3 (Time of Assessment) mixed ANOVA on these scores, and found a significant effect of time, F(2, 388) = 15.97, p < .001, η² = .04, as well as an interaction between time, valence condition, and manipulation type, F(2, 388) = 18.89, p < .001, η² = .05. In follow-up univariate ANOVAs, we found no significant effects at Time 1 or Time 2 (all ps > .07), indicating participants across conditions and age groups had comparable moods before beginning and after finishing the study. However, immediately after the manipulation (Time 2), we found a main effect of valence condition, F(1, 389) = 18.71, p < .001, η² = .05, which was modified by a two-way interaction between valence condition and manipulation type, F(1, 389) = 19.29, p < .001, η² = .05. As seen in Table 5, the interaction was clearly driven by those who received the traditional mood manipulation. Comparisons within each manipulation condition revealed a significant effect of valence for those in the mood manipulation condition (p < .001), but not for those who completed the health rating task (p = .99).

We next examined whether our health manipulation affected participants' perceptions of their health-related behaviors. Although we had no explicit measure of these perceptions, we identified two subscores of the SF-8 that indicate one's perceptions of how much physical or emotional health problems limit engagement in regular activities (i.e., Role Emotional and Role Physical scores) as items of interest. There were no effects of condition when examining SF-8 scores as a whole, but we suggest that these specific subscores are most related to what we intended to manipulate (i.e., perceptions of one's engagement in healthy activities), and they were moderately correlated, r = .47, p < .001. Thus, we took the average of the two subscores and examined them using a 2 (Age Group) × 2 (Manipulation Types) × 2 (Valence Condition) ANOVA. There was a significant main effect of valence condition, F(1, 388) = 4.13, p = .04, η² = .01, which was modified by a significant three-way interaction, F(1, 388) = 6.00, p = .02, η² = .02. All other effects were not significant (ps > .10). To deconstruct the interaction, we conducted separate 2 (Age Group) × 2 (Valence Condition) ANOVAs within each manipulation type condition. There were no significant effects in the mood manipulation condition (ps > .07). However, in the health manipulation condition, there was a significant main effect of valence condition, F(1, 195) = 6.90, p = .009, η² = .03, indicating that those in the negative condition (M = 46.56; SD = 0.64) had more negative perceptions of their health than those in the positive condition (M = 48.94; SD = 0.64). There was also a significant main effect of age group, F(1, 195) = 6.69, p = .01, η² = .03, indicating that older adults (M = 46.58; SD = 0.65) had more negative perceptions of their health than those in the young adults (M = 48.92; SD = 0.63). Importantly, Age Group × Valence interaction was not significant, (p > .11), suggesting that the effect of our health manipulation was not dependent upon age group. In sum, the results of these analyses support the effectiveness and specificity of our experimental manipulations, both with respect to responses to the stimuli and the impact on self-perceptions.

Interest in negative health-related articles. Our primary focus was on the impact of age and our experimental manipulations on the number of negative articles selected, which we examined using a 2 (Age Group) × 2 (Valence Condition) × 2 (Manipulation Type) ANOVA. A significant main effect of valence was obtained, F(1, 383) = 7.94, p = .005, η² = .02, which was moderated by both manipulation type and valence condition, F(1, 383) = 8.51, p < .004, η² = .02 (see Figure 1). The effect size associated with the interaction is rather small, but subsequent comparisons revealed stronger effects associated with the comparisons of interest. Specifically, to further examine the significant 3-way interaction, we performed separate 2 (Age Group) × 2

² Given the age or group differences in gender and some health-related variables (Table 1), we included these as covariates in all of our analyses. In no case were the covariates significant. Therefore, the reported results do not include these covariates.
Table 5. Design of Images, Mood, Health Behavior Perception (HBP), and Goal Priorities for Young and Older Adults in Positive and Negative Low-Informativeness and High-Informativeness Conditions in Study 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study 1</th>
<th>Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>8.89 (0.67)</td>
<td>10.22 (12.25)</td>
</tr>
<tr>
<td>Health</td>
<td>9.12 (11.44)</td>
<td>9.00 (11.39)</td>
</tr>
<tr>
<td>Health behavior perception</td>
<td>0.58 (0.62)</td>
<td>0.48 (0.64)</td>
</tr>
<tr>
<td>Goal priorities - questionaire</td>
<td>0.16 (0.18)</td>
<td>0.16 (0.18)</td>
</tr>
<tr>
<td>Goal priorities - scenario</td>
<td>0.09 (0.08)</td>
<td>0.09 (0.08)</td>
</tr>
<tr>
<td>Older adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>8.30 (0.67)</td>
<td>9.20 (12.25)</td>
</tr>
<tr>
<td>Health</td>
<td>9.22 (11.44)</td>
<td>9.08 (11.39)</td>
</tr>
<tr>
<td>Health behavior perception</td>
<td>0.58 (0.62)</td>
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<tr>
<td>Goal priorities - scenario</td>
<td>0.09 (0.08)</td>
<td>0.09 (0.08)</td>
</tr>
</tbody>
</table>

Figure 3. Interest in negative health-related information as a function of age group (young/older), valence condition (negative/positive), and manipulation type (mood/health behavior perception manipulation). Error bars represent 95% confidence intervals.

Valence Condition) ANOVAs within each manipulation condition. No significant effects (ps > .12) were obtained in the traditional mood manipulation condition. In contrast, in the health condition, a significant main effect of valence was obtained, F(1, 105) = 11.10, p = .001, η² = .05, along with a significant Age × Valence interaction, F(1, 195) = 8.09, p = .005, η² = .04. We explored this interaction by comparing valence conditions within each age group. For the young adults, this comparison was not significant (p = .72), with those in the negative health condition (M = −3.31, SD = −0.68) selecting a similar number of negative articles as those in the positive health condition (M = 1.36, SD = 0.76). In contrast, older adults in the negative health condition (M = 1.10, SD = 0.81) selected significantly fewer negative articles than those in the positive health condition, (M = 1.76, SD = 0.77), F(1, 95) = 17.14, p < .001, η² = .13, reflecting a medium-large effect size. Taken together, these findings indicate that the effect of valence on the intent to read negative health-related information was specific to both the health condition and older adulthood, a finding consistent with our expectations.

**Goal priorities.** We next investigated whether participants in different conditions and age groups varied in their reported goal priorities after completing the image rating or health checklist tasks. We first conducted a 2 (Age Group) × 2 (Valence Condition) × 2 (Manipulation Type) ANOVA on the GPI emotion factor score and found no significant effects (all ps > .14). The same analysis performed on the GPI information factor scores revealed a significant effect of valence condition, F(1, 389) = 12.05, p < .001, η² = .04, due to those in the positive condition (M = .18, SD = .06) having higher information goals than those in the negative condition (M = −1.17, SD = .06). There was also a significant three-way interaction, F(1, 389) = 5.73, p = .02, η² = .02. To decompose this interaction, we ran separate 2 (Age Group) × 2 (Valence Condition) ANOVAs for each of the manipulation types. In the traditional mood manipulation condition, there was an effect of age group, F(1, 194) = 4.30, p = .04, η² = .02, with older adults (M = 0.06, SD = 0.80) having higher information goals than young adults (M = −0.20, SD = 0.96), as well as an effect of valence condition, F(1, 194) = 11.89, p = .001, η² = .06. With those in the positive condition (M = 0.14, SD = 0.68) having higher information goals than those in the
negative condition \((M = -0.29, SD = 1.02)\). These effects were
qualified by an Age \(\times\) Valence interaction, \(F\) (1, 194) = 6.31, \(p = .01\), \(\eta^2 = .03\), due to particularly low information goals for young
adults in the negative mood condition \((M = -0.56, SD = 1.05)\).

In the health behavior perception manipulation conditions, there was
only a significant effect of valence, \(F\) (1, 195) = 3.93, \(p = .02\), \(\eta^2 = .03\), with those in the positive condition \((M = 0.22, SD =
0.73)\) having higher information goals than those in the negative
condition \((M = -0.07, SD = 1.00)\). Thus, our manipulation of
health behavior perception was similarly associated with information
goals across age groups.

**Mediation analyses.** After determining that the valence of the
manipulation influenced preferences for negative information in the
context of health, but not a traditional mood manipulation, we
explored goal priorities as potential mechanisms through which perceptions of one’s health might influence preferences for
negative health-related information. To avoid having a categorical
predictor variable (valence condition), we replaced our assigned
conditions with participants’ health checklist scores, which could
range from \(-6\) to \(+6\). This made our predictor variable sensitive
to the effectiveness of our manipulation. Additionally, it allowed
us to account for individuals who may have endorsed more of the
“unlikely” than the “likely” behaviors on our checklist, thus
constituting a response pattern opposite to that intended. We first
examined mood as a mediator, using reports of mood at Time Point
2 (after filling out the health checklist). A mediation analysis using
PROCESS Model 4 (Hayes, 2013) revealed no significant mediation,
a result that is consistent with the previously reported finding of the
traditional mood manipulation having no impact on selection of
negative articles.

We then examined goal priorities (indicated by factor scores from the
GPI information subscale) as a mediator of the relationship between
manipulated health behavior perceptions (as indicated by health checklist scores) and interest in negative health-related
information. Noting the age group specificity of previously reported
effects, we also examined possibility that age might moderate the
relationship between health checklist scores and interest. Accordingly, we tested for simultaneous mediation and
moderation using PROCESS Model 5 (Hayes, 2013; see Figure 2).
Results yielded a conditional direct effect of health checklist
scores on interest such that the effect was significant for older adults, \(B = .06, SE = .02, p < .001\), 95% confidence interval
(93% CI \([.03, .10]\)), but not young adults, \(B = .04, SE = .02, p =
.83, 95\% CI [-.03, .04] indicating a moderation relationship.

Notably, the indirect effect of health checklist scores on interest
was not significant, \(B = .01, SE = .003, 95\% CI \([.000, .01]\), as
information goals no longer significantly predicted interests
when including age as a moderator, \(B = .11, SE = .06, p = .08,
95\% CI [-.01, .23].

Noting that the results reported above were predicated on the
assumption that health checklist scores indicated perceptions of
health behaviors, we wanted to examine whether a self-report
measure of health behavior perceptions following the manipulation
might fit into our model in the place of health checklist scores. We
unfortunately did not include an explicit manipulation check of
health behavior perceptions in the present study. However, we
identified the score derived from Role Physical and Role
Emotional subscales of the SF-8 as a self-report measure that is similar
to what we intended to manipulate. We acknowledge that this
score actually measures perceptions of the degree to which one’s
physical and emotional health interfere with engaging in certain
behaviors, rather than perceptions of behavior engagement.

However, we decided to move forward with this analysis and note
the limitations of using this ad hoc indicator. Thus, we tested for
simultaneous mediation and moderation using PROCESS Model 5
using the previously described summary score created from SF-8 Role
Physical and Role Emotional values as an, albeit imperfect,
measure of manipulated health behavior perceptions. As before,
we found a conditional direct effect of SF-8 Role subscales on
interest such that the effect was significant for older adults, \(B =
.03, SE = .01, p = .02, 95\% CI [.004, .05].\) but not for young adults,
\(B = -.01, SE = .01, p = .54, 95\% CI [-.03, .02] indicating a
moderation relationship. In contrast with the previous model, the
indirect effect of SF-8 Role subscales on interest remained
significant, \(B = .02, SE = .004, 95\% CI \([.01, .02]\), when including age
as a moderator, indicating simultaneous mediation and moderation.

In sum, we found that exposure to an experimental manipulation
that biased self-perceptions of health influenced older adults’
willingness to consider negative health-related information. Specifi-

![Conceptual model of the simultaneous mediation and moderation relationship with age group acting as a moderator between health behavior perceptions (as indicated by health checklist scores and SF-8 role subscales) and interests; information goal priorities acting as mediator.](image-url)
cally, older adults primed to experience positive self-perceptions of health were subsequently more interested in reading negative health-related articles than were older adults primed to experience more negative self-perceptions. This effect of valence was not present in young adults—replicating our previous findings in the cognitive domain (Growney & Hess, 2017)—or for those who completed a traditional mood manipulation task. These findings suggest that self-perceptions in a relevant domain, rather than general affect, determine willingness to attend to negative versus positive information. We also found that this same experimental manipulation influenced information-seeking goal priorities (i.e., positive self-perceptions associations with greater goals), which in turn mediated the relationship between manipulated health behavior perceptions and interest in negative health-related information. Importantly, this effect was moderated by age, with mediation strongest in the older group.

**Study 2**

Although the results of our first study were generally consistent with expectations, a few caveats should be considered. First, our manipulation check following the health checklist task relied on an ad hoc measure (i.e., SF-8 subscores) that was not specifically designed to serve this role and that was not temporally contiguous to the manipulation, making it an arguably suboptimal assessment. Second, we did not control for the perceived informational value of the article headlines. An examination of the headlines suggests that there may be slightly more information value associated with the negative than the positive headlines, leading to the possibility that information value of the content, as opposed to the valence of the content, influenced participants’ responses. Finally, the GPl provided a general assessment of a measure of goals related to general information gathering rather than one specifically focused on health-related information. To address these concerns, we conducted a second study that included (a) an explicit manipulation check of participants’ perceptions of their health behaviors immediately following the health checklist task, (b) an additional condition that systematically varied the informativeness of the article headlines, and (c) a modified version of the GPl that specifically focused on health-related information.

**Method**

**Participants.** A new sample of 109 older adults aged 65–85 years was recruited through MTurk with the same selection criteria used in Study 1. Participant characteristics are displayed in Table 1. Individuals were paid $2.00 for participating.

**Materials.** We used the same mood assessments, health behavior perception manipulation task, and measures of health, depression, and chronic conditions previously reported in Study 1. The following materials were either added or modified in the present study.

**Health behavior perception assessment.** We designed a Health Behavior Perception (HBP) Questionnaire as a manipulation check with four items on it intended to gauge the degree to which participants felt good or bad about their health behaviors following the health checklist task. On a Likert scale of 1 (disagree) to 9 (agree), participants responded to the following items: “I think I engage in a good amount of healthy behaviors on a regular basis.” “I think I ought to engage in more healthy behaviors on a regular basis” (reverse-coded). “I feel positive about my health behaviors,” and “I feel negative about my health behaviors” (reverse-coded).

**Goal assessment.** To assess goal priorities specifically related to health, we modified the GPI by replacing the phrase “I would like to . . .” with “When gathering information about health, I would like to . . .” Cronbach’s alpha was .69 for the emotion subscale, .75 for the information subscale, and .71 for the scale overall. Factor loadings are presented in Table 3.

**Information articles.** We created two sets of article headlines: a high-informative set that presented a statement followed by some indication that there would be helpful information included in the article, and a low-informative set that presented only a statement. Each set had both positive and negative headlines, and included topics relating to nutrition, exercise, and sleep. To confirm our a priori assumptions about these headlines, we pilot tested them by having a sample of 21 older adults on MTurk rate the informativeness, negativity, and positivity of each headline on Likert scales of 1 to 7. We conducted a 2 (A Priori Informativeness) × 2 (A Priori Valence) ANOVA on the informativeness ratings and found a main effect of informativeness, Fr(20, 1) = 13.34, p = .002, ηp2 = .40, indicating that participants rated our high-informative headlines (M = 5.85, SD = 1.11) as significantly more informative than our low-informative headlines (M = 5.21, SD = 1.04). There were no effects associated with valence (ps > .22), indicating that our positive and negative headlines did not differ in informativeness. Similar analyses conducted on the emotion ratings revealed only a main effect of valence for both positivity ratings (Mpositive = 5.71, SD = 1.10, Mnegative = 4.39, SD = 1.43), Fr(20, 1) = 13.35, p = .002, ηp2 = .40, and negativity ratings (Mpositive = 1.88, SD = 0.63; Mnegative = 3.13, SD = 1.28), Fr(20, 1) = 14.26, p = .001, ηp2 = .42. There were no effects associated with informativeness. Thus, information value of the headlines did not covary with valence. Article headlines are presented in Table 4.

**Procedure.** We followed the same procedure reported in Study 1 with two additions. First, the HBQ questionnaire was given immediately after participants filled out the health checklist. Second, half of the participants chose from six low-informative headlines and half chose from six high-informative headlines. As in Study 1, each participant saw one negative and one positive headline relating to nutrition, exercise, and sleep, respectively.

**Results and Discussion**

**Manipulation checks and preliminary analyses.** We performed a series of manipulation checks (see Table 5) similar to those reported in Study 1.

**Responses to stimulus materials.** We first created health checklist scores ranging from −6 to +6 using the same method previously reported, and conducted a 2 (Valence Condition) × 2 (Headline Informativeness) ANOVA. As expected, we found a main effect of valence condition, Fr(1, 195) = 156.50, p < .001, ηp2 = .41, indicating that those in the negative condition (M = −1.25; SD = 2.62) had more negative health scores than those in the positive condition (M = 3.33; SD = 2.51). All other effects were not significant (ps > .41), indicating that those who
subsequently saw high versus low-informative headlines did not differ in their responses.

**Self-ratings.** To calculate scores of participants perceptions of their health behaviors following the health checklists, we re-scored the two negative items in the HBP questionnaire and then calculated the mean of the four items. A 2 (Valence Condition) × 2 (Headline Informativeness) ANOVA conducted on these scores revealed the expected main effect of valence condition, F(1, 195) = 10.13, p < .001, η² = .05, indicating that those who completed the positive checklists had more positive perceptions of their health behaviors (M = 5.72, SD = 1.20) than those who completed the negative checklists (M = 5.13, SD = 1.11). No other effects were significant (ps > .44).

We also examined mood using the same method of calculating mood scores used in the first study. A 2 (Valence Condition) × 2 (Headline Informativeness) × 3 (Time Point) mixed ANOVA on these scores revealed a significant effect of time, F(2, 390) = 5.47, p = .005, η² = .03, as well as an interaction between time and valence condition F(2, 390) = 5.17, p = .007, η² = .03. There were no effects associated with headline informativeness (ps > .26). We followed up with univariate one-way ANOVAs examining valence condition effects on mood at each of the time points. We found no significant effects at Time 1 or Time 2 (all ps > .15), indicating that participants who filled out the differently valenced checklists did not differ in mood before or after completing the checklists. However, there was an effect of valence condition at Time 3 (recorded at the end of the study), F(1, 195) = 4.67, p = .03, η² = .02, indicating that those in the positive condition, (M = 16.50; SD = 12.02) felt more positive at the end of the study than those in the negative condition, (M = 12.78; SD = 12.46).

**Interest in negative health-related articles.** To investigate the nature of participants’ interest in the study, we conducted a 2 (Valence Condition) × 2 (Headline Informativeness) ANOVA on the total number of negative articles participants selected. There was a significant effect of headline informativeness, F(1, 195) = 12.25, p = .001, η² = .06, indicating that those in the high-informative conditions (M = 1.56, SD = 0.76) selected more negative articles than those in the low-informative conditions (M = 1.21, SD = 0.69). Importantly, there was also a significant interaction between valence and informativeness, F(1, 195) = 7.13, p = .008, η² = .04 (see Figure 3). Follow-up analyses revealed that the valence effect was significant in the high-informative condition, F(1, 98) = 10.22, p = .002, η² = .09, with more negative articles selected in the positive condition (M = 1.80, SD = 0.81) than in the negative condition (M = 1.33, SD = 0.62). In contrast, there was no significant effect of valence for low-informative headlines, F(1, 97) = 0.28, p = .59, η² = .003, with the number of negative headlines selected being relatively low in both the positive condition (M = 1.17, SD = 0.74) and the negative condition (M = 1.25, SD = 0.64).

**Goal priorities.** We calculated GPI information and emotion factor scores using the same method described in Study 1, and we conducted 2 (Valence Condition) × 2 (Headline Informativeness) ANOVAs on each of them. Given that the GPI was completed prior to exposure to the headlines, no impact of informativeness was expected. As before, there were no significant results with the analysis of the GPI emotion subscale (ps > .44). Analysis of the GPI information subscale, however, once again revealed a significant effect of valence, F(1, 195) = 6.48, p = .01, η² = .03, with those in the negative condition (M = −0.17; SD = 1.10) reporting lower health-related information goals than those in the positive condition (M = 0.16; SD = 0.70). No other effects were significant (ps > .42). Factor loadings are presented in Table 3, and mean scores for each condition are presented in Table 5.

**Mediation analyses.** In our final set of analyses, we first eliminated the possibility that mood might serve as a mediator by examining Time 3 mood scores in mediation models with manipulated health and health checklist scores as predictors. After finding no mediation associated with mood, we next examined the possibility of moderated mediation with goal priorities mediating the relationship between health behavior perceptions and negative articles selected, but with mediation moderated by informativeness condition. Using participants’ self-reports of health behavior perceptions from the HBP questionnaire following the health checklist task, we tested for moderated mediation using PROCESS Model 15 (Hayes, 2013). We found that health behavior perceptions predicted information goal priorities for our entire sample, B = 0.25, SE = 0.05, p < .001. Using the bootstrap estimation approach with 5,000 samples, we tested the direct effect of health behavior perceptions on selection of negative articles, and found a conditional direct effect such that health behavior perceptions had a direct effect on article selection for those who viewed high-informative headlines, B = 0.13, SE = 0.06, p = .04, but there was no direct effect for those who viewed low-informative headlines, B = 0.02, SE = 0.06, p = .66. Similarly, there was a conditional indirect effect of health behavior perceptions on article selections such that the effect was significant for those in the high-informative conditions, B = 0.05, SE = 0.02, CI [.01, .10], but not for those in the low-informative conditions, B = 0.01, SE = 0.02, CI [.02, .06], indicating that goal priorities mediated this relationship only for those who viewed high-informative headlines.

We repeated this analysis using health behavior perceptions derived from health checklist scores, with results mirroring those obtained in Study 1. Specifically, health behavior perceptions predicted information-goal priorities for our entire sample, B = 0.08, SE = 0.02, p < .001. We tested the direct effect of health checklist scores on selection of negative articles using the bootstrap estimation approach with 5,000 samples, and found a condi-
tional direct effect such that health behavior perceptions had a direct effect on article selection for those who viewed high-informative headlines, $B = 0.06, SE = 0.02, p = .007$, but there was no direct effect for those who viewed low-informative headlines, $B = -0.03, SE = 0.02, p = .21$. Similarly, there was a conditional indirect effect of health checklist scores on article selections such that the effect was significant for those in the high-informative conditions, $B = 0.2, SE = 0.01, CI [.01, .03]$, but not for those in the low-informative conditions, $B = 0.01, SE = 0.01, CI [-.01, .02]$, indicating that goal priorities mediated this relationship only for those who viewed high-informative headlines (see Figure 4).

To summarize, we essentially replicated the findings from the health checklist condition in Study 1, both in terms of the effects of the health checklist manipulation on article interest and the mediation of the effect of self-perceptions of health on interest through information goal prioritization. Notably, this study extended the findings of the first study by demonstrating that these effects were most evident in articles that were considered relatively high in informativeness regarding health behaviors. This finding is consistent with one of the assertions of the mood-as-resource framework that states that mood will only serve as a resource in information gathering when such information is relevant or useful to the individual. Note also that the effects of Study 1 generalized to the present situation in which a more optimal check of the health manipulation was used and in which the GPI was specifically geared toward health behaviors.

**General Discussion**

The present research was designed to examine the conditions that would promote older adults’ attention to negative, but personally relevant information. Consistent with our previous research (Growney & Hess, 2017), we found that bolstering perceptions of self within the behavioral domain of interest resulted in greater willingness to entertain self-relevant negative information, with this effect being specific to older adults and situations where the information to be gathered has some informative value. Importantly, we extended our findings to a new context having to do with health-related behaviors, thereby suggesting that our previous results having to do with cognitive ability were not specific to that domain of behavior.

A critical aspect of the present research was the identification of the resources that influence differential attention to either positive or negative personally relevant information. Although we used the mood-as-resource framework (Troeche et al., 2001) as a basis for our research, the perspective is somewhat vague in its explanation of how mood affects preferences, attention, and behavior. Specifically, is it mood itself that serves as a resource or is the hypothesized affective resource related to some other more fundamental mechanism? In our previous study (Growney & Hess, 2017), our experimental manipulation confounded self-perceptions in a relevant domain (i.e., cognitive ability) with mood. Thus, we were unable to conclude confidently whether older adults were using positive mood as a resource in gathering information about performance or positive perceptions about their cognitive ability. However, in unpublished analyses on those data, we found no evidence that self-reported mood mediated the relationship between our experimental conditions and outcomes. In the present study, we obtained more conclusive evidence that it is not mood itself that influences attention to positive or negative information, but rather a mood-related resource based in perceptions of self in the domain of interest. In our case, feeling good or bad about one’s health influenced the degree to which older adults were interested in learning more about positive or negative health-related information; simply feeling good or bad in general did not have this same effect. We suggest that the mood-as-resource label is somewhat of a misnomer, and that one must target an individual's self-perception in a relevant domain to influence subsequent preferences, attention, and behavior.

Many of the limitations associated with Study 1 were addressed in Study 2. In Study 1 we did not include a manipulation check and instead used a score derived from SF-8 Role Physical and Role Emotional subscales as a predictor in our model. Interestingly, these self-reports of the degree to which health affects engagement in certain behaviors fit into our model similarly to our health checklist score and HBP score from Study 2. One possibility is that participants who were made to perceive their levels of engagement in healthy behaviors as high or low were inclined to attribute these perceived levels to emotional or physical health concerns. Our HBP questionnaire added to Study 2 confirmed that we manipulated perceptions of health behaviors and that these explicitly measured perceptions predicted interest in negative health-related

![Figure 4](image.png)

*Figure 4.* Conceptual model of the moderated mediation relationship with headline informativeness condition acting as a moderator between health behavior perceptions (as indicated by health checklist scores as well as scores from the health behavior perception questionnaire) and interests, and information goal priorities acting as mediator.
information, with information goal priorities specifically relating to our domain of interest mediating the relationship. Our addition of low and high-informative headline conditions in Study 2 addressed the concern that the negative and positive headlines used in Study 1 may have differed in informativeness as well as valence. We found that results from Study 1 were replicated only in the high-informative headlines conditions, with older adults who felt positive about their health behaviors showing relatively high levels of interest in negative health article headlines only when those headlines suggested that the article offered helpful advice or information. This suggests that older adults may perceive that it is only worth looking at negative information if it is highly informative, further delineating the context in which older adults may be able to successfully use positive self-perceptions as a resource in handling negative information.

In the present study, we replicated some findings from our earlier study (Grawe and Hess, 2017), which on the surface appear to be inconsistent with SST. This theory suggests that older adults tend to be more positive and more concerned with maintaining positive affective states compared with young adults. According to SST, relative to younger adults, this chronic emotion-focused goal should lead older adults to disproportionately attend to positive information to maintain affective well-being. Some research has suggested, however, that the presumed chronic emotion goals associated with late life may be overridden by situational goals associated with potentially negative affective circumstances (e.g., coping with an illness), resulting in the absence of a positivity effect (English and Carstensen, 2015; Reed and Carstensen, 2012). The results of both our previous and current studies are examples of situational goals taking precedence over emotional goals that are chronically activated, but suggest that in order for these situational goals to take precedence, older adults must have sufficient resources relating to their feelings about themselves in the target domain. Specifically, we observed that older adults in positive states do not necessarily focus on positive information with the goal of maintaining positive affect, but rather appear predisposed to the consideration of negative information when feeling positive about themselves. Notably, they also do not need to be experiencing some potential threat to self to focus on negative information. The key consideration in the present case is that the older adults were not just feeling positive, but were feeling positive about themselves within a specific domain of functioning, which may have provided the ego strength to consider potentially negative information about themselves.

Seeming inconsistencies with SST were also reflected in reported goal priorities. One might expect older adults to report relatively high emotion-focused goals, regardless of condition, as a chronic emotional goal would make them either want to feel better emotionally when feeling negative, or maintain their current positive emotions when feeling positive. However, in both of our studies, we found no condition or age group differences in emotion-focused goals, suggesting a broader, non-age-specific prioritization that contrasts with SST’s supposition that older adults favor emotion goals while young adults are concerned with information gain. In the present study, we also found that information goal priorities were higher for those in the positive conditions, regardless of age. This suggests that information-focused goals may be more flexible, and likely enhanced in situations where individuals have relevant positive self-perceptions. It is also notable that young adults (as well as older adults) reported lower information-seeking goals in conditions where they were in negative versus positive states, as SST might suggest that feeling negative would be less consequential for young adults’ goal priorities. We note, however, that these goal priorities were not reflected in young adults’ actual behavior to the same degree as older adults’. Taken together, our findings that positive states were actually associated with higher information-seeking goals, as well as more openness to exposure to negative information for older adults appear inconsistent with SST-hypothesized relationships between age, goals, and attention to valenced information. Furthermore, we suggest that willingness to consider negative information may be more tied to high information-seeking goals than low emotion-regulation goals.

Findings of the present and earlier study are also inconsistent with previous work examining mood-as-resource with young adults (e.g., Aspiwall & Burnhart, 1996; Das, Vonkeman, & Hartmann, 2012; Gasper & Zawadzki, 2013; Gervey et al., 2005; Raghunathan & Trope, 2002; Trope & Neter, 1994; Trope & Pomerantz, 1998). Potential explanations for our lack of effects in young adults relate to the nature of the information to be gathered, the age-relevance of the manipulated construct, and the degree to which we successfully manipulated the construct across age groups. It is clear that the article headlines from which participants selected were more relevant to older than young adults and had relatively more informative value to older adults. As demonstrated in Study 2, positive self-perceptions may only be a resource in situations where the information is viewed as highly informative, and young adults may not have perceived much value in reading about health issues pertaining to older adults. Second, manipulating the perception of one’s engagement in healthy behaviors may have differentially affected goal priorities and subsequent interests, attention, and behavior for young and older adults. It is notable that studies successfully demonstrating mood-as-resource effects in younger adults selected domains of functioning that either specifically related to the participants’ health habits (e.g., caffeine consumption: Raghunathan & Trope, 2002; smoking: Das et al., 2012; personal health risks: Aspiwall & Burnhart, 1996) or were more salient to their age group (e.g., assets or liabilities for attaining personal life goals or specific careers: Trope & Pomerantz, 1998; logic abilities for undergraduate students: Gasper & Zawadzki, 2013; preconscious abilities: Gervey et al., 2005; social sensitivity: Trope & Neter, 1994). Thus, the salience of the domain may moderate the impact of affect-based resources through activation of specific emotional responses and associated goals. We suggest that perceptions of health and cognitive ability may be stronger components of self-perception for older adults than young adults, making our manipulations more far-reaching. Lastly, despite the comparable health checklist scores and SF-8-derived scores across age groups in Study 1, our first study did not include an explicit manipulation check of health behavior perceptions, so we are unsure whether young adults’ health behavior perceptions were manipulated to the same extent as older adults’. It is possible that completing the negative health checklist, for example, may have disproportionately lowered older adults’ health behavior perceptions as well as their self-efficacy in this domain. Furthermore, preexisting health behavior perceptions may have been more fragile in older adults, potentially making them more susceptible to the experimental manipulation. It is also
likely that health literacy might influence young and older adults’ self-efficacy as well as interest in different types of health-related information.

The obtained pattern of results also suggests that older adults’ levels of self-efficacy in the domain of health may have altered the degree to which they viewed the articles as resources from which they might learn valuable applicable information. Past research suggests that positive mood is most likely to be an effective resource for dealing with negative information when it is relevant and helpful to the individual (e.g., Raghunathan & Trope, 2002). This is consistent with our findings from Study 2, as older adults used mood as a resource only when presented with high-informative headlines. In line with the idea that domain-specific self-efficacy plays an important role in older adults’ willingness to consider negative information, the lines-of-defense model for managing health threats (Heckhausen et al., 2013) suggests that perceptions of the attainability of health may influence goal engagement and disengagement. In the present study, we manipulated perceptions of health, and also may have increased the urgency of this goal by making it more salient. That is, having older adults fill out the health checklists may have imposed a developmental deadline, by having them assess themselves as either successful or unsuccessful in the domain of health. As suggested by this model, older adults who felt positive about their health (i.e., experienced success) may have been motivated to invest time, effort, and resources into the maintenance of their health, whereas those who felt negative about their health (i.e., experienced failure) may have deactivated their motivational commitment to health in an effort to protect their resources for another goal that seemed more attainable, such as mood repair or self-esteem bolstering.

In conclusion, our findings suggest that self-perceptions in the health domain, along with information-focused goal priorities, influence the degree to which older adults show interest in learning more about health information that is important and informative, but difficult to handle. It was previously thought that general positive affect may serve as a resource, but we suggest that older adults may be more willing to consider negative but helpful information in situations where their self-perception in that particular domain is positive. Importantly, we demonstrate that self-perceptions are malleable, and present an additional way in which older adults’ positivity biases may be moderated by situational factors. Results of this study have practical implications for physicians and health care professionals who aim to effectively present a wide variety of information to older adults. Especially in situations where a message cannot be framed positively so as to enhance older adults’ response (e.g., Notthoff & Carstensen, 2014; Shamaskin et al., 2010), we would advise practitioners to consider the patients’ view of their health before starting a difficult discussion about their conditions. Sating the positives in the situation, or even acknowledging the patient’s positive health behaviors may create an environment in which the patient is more receptive to advice or willing to consider negative information.

References


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Manuscript 3: Longitudinal relationships between resources, motivation, and cognitive engagement

The third manuscript is a longitudinal examination of resources, motivation, and activity engagement as described in SET with the concept of resources expanded to include emotional health. A previous longitudinal study (Hess et al., 2012) obtained support for SET, demonstrating that changes in motivation mediated the relationship between changes in various resources (i.e., sensory functioning, physical health, and vocabulary) and changes in engagement in reading/writing activities. Lack of assessment uniformity and suboptimal measures of activity engagement are two limitations associated with the previous study that we addressed in this manuscript, with the aim of replicating the findings with new uniform assessments and a more diverse measure of activity engagement (a modified version of the activities questionnaire from the Victoria Longitudinal Study; VLSAQ; Jopp & Hertzog, 2010). We also expected to find clearer evidence for selectivity with our inclusion of a wide variety of activities associated with varying levels of cognitive demands.

Although originally not recruited for a longitudinal study, we identified 308 individuals who participated in research in NC State University’s Adult Development Lab between two and five times between the years 2010 and 2016. The sample included 125 young adults (age 19-42 at first time of assessment) and 183 older adults (age 60-85 at first time of assessment). Each time these individuals participated in a study, they completed a standard set of questionnaires and assessments relating to resources (a number of assessments of each of the following: cognitive ability, physical health, emotional health, and sensory functioning), motivation (Need for Cognition: NFC; Cacioppo, Petty, Feinstein, & Jarvis, 1996; Personal Need for Structure:
PNS; Neuberg & Newsom, 1993), and activity engagement (technical, physical, developmental, experiential, social, game, and TV activity items from the VLSAQ; Jopp & Hertzog, 2010).

Our mediation analyses followed a multilevel structural equation modeling (MSEM) framework suggested by Preacher, Zypher, and Zhang (2010), with some slight modifications to accommodate the structure of our data. Specifically, on the within-level, we regressed each variable (or latent variable) on linear time in order to capture change in each variable of interest, and on the between-level we specified our mediation model. Thus, the between-level model referred to relationships among variables over time, but within persons. We found that changes in emotional health and sensory functioning predicted changes in motivation to engage in cognitively demanding activities. Analyses within age groups revealed that these effects were driven by the older adults. Additionally, increases in motivation predicted increases in engagement in resource-demanding activities (i.e., technical, developmental, experiential, and social activities), but decreases in less demanding activities (i.e., TV watching). Lastly, motivation partially mediated the relationships between changes in emotional health and engagement in technical, developmental, experiential, and social activities, as well as between changes in sensory functioning and engagement in technical activities.

Results provide support for SET, demonstrating associations between changes in resources, motivation, and engagement in activities that are particularly demanding of cognitive resources—an example of selectivity—with the strength of these relationships being stronger in older than in young adults. However, this finding was specific to certain types of resources, and it is notable that changes in physical health and cognitive ability were not associated with changes in motivation in older adults, for whom these resources tend to decrease. Lastly, these
findings suggest that emotional resources may be particularly influential in determining the motivation for activity engagement in later life.
Longitudinal Relationships between Resources, Motivation, and Cognitive Engagement

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Abstract

Activity engagement has been associated with maintained cognitive functioning in later life. Selective Engagement Theory (SET; Hess, 2014) suggests that as a result of declining resources and increases in the costs associated with activity engagement, older adults become selective about the types of activities in which they engage. We examined longitudinal assessments of resource and motivational factors that might contribute to engagement in cognitively demanding activities in young (n = 125; age 19-42 at Time 1) and older (n = 183; age 60-85 at Time 1) adults who were tested from two to five times between years 2010 and 2016. We included physical health, emotional health, sensory functioning, and cognitive ability as resources, with the expectation that emotional health might be a particularly important resource for older adults given its relative preservation with age. Using multilevel structural equation modeling, we found that changes in motivation mediated the relationship between changes in two resource variables (i.e., sensory functioning and emotional health) and activity engagement. These relationships were specific to demanding activities and were stronger in older than young adults, providing support for SET. Additionally, laboratory assessments of cognitive ability were better modeled as outcomes of changes in resources and motivation, rather than a resource contributing to motivation and engagement, suggesting that older adults’ performance on such tests may rely on factors other than ability. Findings suggest that in later life, emotional resources may be particularly influential in determining motivation to engage in demanding activities.
A substantial body of research has examined the relationships between engagement in different types of activities and maintenance of cognitive functioning in old age. A number of studies have demonstrated a positive association between continued engagement in activities that are demanding of resources and maintained functioning in later life, with evidence present for relationships between activity engagement in a number of different domains and cognitive ability (for review, see Hertzog, Wilson, Kramer, & Lindenberger, 2009). Some research points to cognitive activity engagement as the strongest predictor of cognitive ability (e.g., Bielak, Hughes, Small, & Dixon, 2007; Ghisletta, Bickel, & Lövdén, 2006; Sturman, Morris, Mendes de Leon, Bienias, Wilson, & Evans, 2005). Other research has recognized physical activity engagement as a robust predictor of cognitive ability (for review, see Colombe & Kramer, 2003). Social activity engagement has also been identified as an important factor, with longitudinal assessments revealing associations between increases in social activity and decreases in the rate of cognitive decline (Hwang, Park, & Kim, 2018; James, Wilson, Barnes, & Bennett, 2011) as well as lowered dementia risk (Zhou, Wang, & Fang, 2018), and cross-sectional data suggesting a positive association between social engagement and cognitive ability (e.g., Su, Huang, Jin, Wan, & Han, 2018). Although it is commonly accepted that engaging in all of these types of activities is beneficial, little attention has been directed towards understanding why some older adults choose to engage in demanding activities, while others do not. A number of factors may be responsible for discrepancies in activity selection among older adults. For example, personal resources in the form of physical health, emotional health, sensory functioning, and cognitive ability may all influence the willingness and motivation to engage in demanding activities, with both individual differences and change in these factors over time influencing patterns of engagement. In the present study, we examine the extent to which motivation mediates the
relationship between longitudinal change in various types of personal resources and activity engagement, and whether this relationship varies based on the age of the individual and the cognitive demands of the activity.

Some older adults may choose not to engage in demanding, but beneficial activities as a result of their declining resources. According to Selective Engagement Theory (SET; Hess, 2014), normative declines in physical and cognitive resources in later life lead to an increase in the costs associated with engagement in cognitively demanding activities. This rise in the costs of engagement impacts the motivation to participate in demanding activities, resulting in older adults becoming increasingly selective in the types of activities in which they choose to engage their limited resources. This increased selectivity is manifested in two specific ways. First, it results in the perceived personal benefits of an activity being a disproportionate determinant of engagement in older adults. Second, and of relevance to the present study, increased costs lead to a general decrease in intrinsic motivation to engage, which is manifested as an increased selectivity in engagement based on the demands of the activity (e.g., reduced willingness to engage in or devote resources to cognitively demanding activities).

This latter prediction of SET has been tested in a number of studies examining the relationship between resources—which are assumed to underlie changes in cognitive costs—motivation, and activity participation. Three studies using cross-sectional data provided support for the hypothesized relationship. In one study (Hess, 2001), the relationship between cognitive and health-related resources and engagement in cognitive and social activities was shown to be mediated by personal need for structure (PNS; Neuberg & Newsom, 1993), which reflects the preference for simplicity in both cognitive activity and cognitive structures. Two later studies using more extensive assessments of activity engagement obtained similar results as well as
support for selective engagement. Using data from the Health and Retirement Survey, Queen and Hess (2018) found that the motivation to engage in cognitively demanding activities—as assessed by Need for Cognition (NFC; Cacioppo, Petty, Feinstein, & Jarvis, 1996)—partially mediated the relationship between resources and activity engagement, with the mediation being stronger for demanding activities (e.g., using a computer, writing) than for less demanding ones (e.g., TV watching). Similar results were obtained in another study (Hess, Grownney, O’Brien, Neupert, & Sherwood, 2018) that used a more extensive sampling of everyday activities based on the Victoria Longitudinal Study Activities Scale (VLSAQ; Jopp & Hertzog, 2010) assessed both retrospectively and over five weeks following assessments of resources and motivation. A limitation of the aforementioned studies was their reliance on cross-sectional data, precluding the ability to examine the causal relationships proposed by SET. An initial longitudinal investigation (Hess, Emery, & Neupert, 2012) found that motivation—assessed as a composite of NFC and PNS—partially mediated the relationship between changes in resources (i.e., sensory abilities, physical health, and vocabulary) and changes in participation in reading/writing activities. Notably, this study found that mediation was more likely when ability (working memory, processing speed) was treated as an outcome than when used as a resource variable predicting motivation in our models. This provides support for the idea that older adults’ performance on some cognitive tests is at least partially reliant upon motivational factors in addition to the latent ability construct being assessed. Finally, some evidence of moderated mediation was also observed, with the hypothesized mediation effect being for older individuals than for younger individuals (e.g., the relationship between physical health, motivation, and processing speed).

Taken together, previous studies examining the conceptual framework of SET have provided support for the idea that motivation is particularly consequential for older adults’
engagement, and that older adults are selective in their engagement of resources. However, these findings should be considered with a number of caveats. As already noted, three of the studies described here are cross-sectional in nature, allowing for the possibility of overestimation of effects. In addition, the assessments of resources and activities across studies was not always optimal. For example, the Hess et al. (2012) used different assessments of resource constructs across times of measurement and had only two single-item activity assessments.

In the present study, we aimed to address these limitations using longitudinal data collected from individuals who participated in multiple studies in our lab between the years 2010 and 2016 using a consistent and stronger set of measures relating to the constructs of interest across all times of measurement. A multidimensional assessment of everyday activity was done using a modified version of the VLSAQ that examined engagement in seven different types of activities (i.e., physical, developmental, experiential, social, game, technical, and TV activities) that varied in their assumed cognitive demands (based on associations with cognitive ability found in Jopp & Hertzog, 2010). A multivariate approach was also taken in assessing resources in the form of physical health, emotional health, cognitive ability, and sensory functioning.

We hypothesized that changes in resources would influence changes in motivation, and changes in motivation would influence changes in activity engagement and ability. In addition, we predicted a mediation relationship wherein changes in motivation would mediate the relationship between changes in resources and changes in activity engagement. Importantly, we take on a more expansive view of resources in the present study compared with other studies, including cognitive ability, physical health, sensory functioning, and emotional health as indicated by measures of mental health and affect. We viewed emotional health as a potentially significant resource for older adults considering that they generally demonstrate higher levels of
ment health and emotional well-being than younger adults (e.g., Charles & Carstensen, 2009; Consedine & Magai, 2006; Kunzmann, Little, & Smith, 2000). Just as positive physical health may influence motivation through maintained physiological structures (e.g., cardiovascular system, pulmonary health) supportive of functioning, positive emotional health may also serve as a resource through regulatory functions designed to promote well-being along with the potentially beneficial effects of positive affect on action tendencies (e.g., Fredrickson, 2001). This broad perspective of resources allows us to consider that some resources might increase with age, while others decline, allowing for the possibility of maintenance or increases in motivation to engage resources with advancing age.

Although we did not have specific expectations regarding the predictive power of each resource variable, we did have predictions about activity engagement based on the demands associated with each category. Thus, we also tested whether prediction of engagement based in changes in resources and motivation would vary based on the presumed cognitive demands of specific categories of activities. Based on SET as well as results from previously described studies, we hypothesized that significant relationships would arise for the more demanding activities (i.e., physical, technical, developmental, experiential, and social), but not for more passive or leisurely activities (i.e., games, TV).

Our second area of interest relates to outcomes aside from activity engagement—specifically, cognitive ability. Findings from our previous studies suggest that cognitive ability—as assessed by tests of basic cognitive processes—did not serve as a resource factor that predicted motivation (Hess et al., 2012, 2018). Rather, performance on these ability tests (e.g., working memory) was better modeled as an outcome similar to other cognitively demanding activities. We were interested in whether we could replicate our previous findings regarding the
nature of cognitive ability in the present study. Here we model cognitive ability both as a predictor and outcome of motivation to further examine these relationships.

Finally, we were interested in testing whether age moderated the predicted mediated relationships. Specifically, we tested the hypothesis that the mediation of resource by activity associations by motivation would be stronger in older than in younger adults. Whereas we anticipated observed significant variation—both between individuals and across time—in our measures by adults of all ages, the levels of resources and changes therein may have a greater impact in later life. For example, levels of physical health may be more likely to be below some threshold of optimal functioning in older adults, whereas variation in younger adults may occur above this threshold. Thus, changes in resources may be more consequential in predicting motivation and subsequent engagement in older than in younger adults.

**Method**

All data used in present analyses were collected from studies conducted in the Adult Development Laboratory at North Carolina State University (NCSU) between September 2010 and June 2016. Individuals were included in our analyses if they participated in at least two studies during this time period. The data used here is based on a standard background questionnaire as well as assessments of health, attitudes, and cognitive ability administered to each participant in every study conducted in the lab during this time period. All questionnaires and procedures were approved by NCSU’s institutional review board.

**Participants**

Participants were 308 individuals recruited from the greater Raleigh, NC, area through newspaper advertisements, on-line solicitations, and flyers posted in public locations, and who
agreed to have their contact information included in our laboratory participant pool. Individuals in the present study participated in at least one additional study after their initial recruitment for a specific project. Whereas the present study does not represent a planned longitudinal study in the traditional sense, participants were administered a standard set of assessments in each study with the intent of eventually examining changing relationships over time. We do note that because of the nature of this study, there may be some biases in selection. However, initial recruitment into studies used in our dataset was not based on any characteristics other than age appropriateness of the participant for a specific study and their availability. Participants were paid between $20 and $35 for each test session depending on the specific study.

At the time of their first assessment, participants ranged in age from 19 to 85 years. Due to the extreme age-groups design employed by all of the studies included, the present longitudinal study also uses a similar design with 125 young adults (70 females, 55 males) ranging in age from 19.2 to 42.3 ($M = 31.6, SD = 5.5$) at Time 1, and 183 older adults (90 females, 93 males) ranging in age from 60.6 to 84.8 ($M = 71.5, SD = 5.3$) at Time 1. Participants were tested from two to five times ($M = 2.4, SD = 0.6$) during the time period being analyzed, and a one-way analysis of variance (ANOVA) revealed no age-group differences in the number of times individuals participated ($p > .36$). Table 1 displays participant characteristics at Time 1 for each age group.

**Materials**

We collected each of the following measures at each time of assessment.

**Resources. Physical health.** The physical health subscale from the SF-36 (Ware, 1993) was used as an indicator of self-reported health. A modified version of the chronic conditions
checklist used in the Midlife in the United States study (see Marmot, Ryff, Bumpass, Shipley, & Marks [1997] for description of this list) was used to measure the number of health issues participants were facing at each time of assessment. This assessment asks participants to report whether they have been diagnosed with and are currently experiencing any of 29 chronic illnesses or disorders with the option to check “other”.

*Emotional health.* Our assessment of emotional health includes both measures of mental health and prevalence of negative and positive emotions. We measured self-reported mental health using the mental health subscale from the SF-36 (Ware, 1993) and depressive symptoms with the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986). We used the positive affect and negative affect subscales from the 30-day Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to measure the degree to which participants reported feeling a number of positive and negative emotions over the 30 days prior to each assessment.

*Sensory functioning.* Two separate items on the standard background questionnaire were used to assess self-perceptions of sensory functioning on a Likert scale of 1 (excellent) to 5 (poor). One item assessed eyesight: “How is your eyesight (with your glasses/contacts)?” and another assessed hearing: “How is your hearing (with your hearing aid, if you wear one)?” We reverse-coded these scores to improve interpretability of our models.

*Cognitive ability.* Assessments of cognitive ability were conducted after study-specific tasks were completed. The Letter-Number Sequencing (LNS) test and the Digit-Symbol Substitution (DSS) test from the Wechsler Adult Intelligence Scale–Third Edition (WAIS-III; Psychological Corporation, 1997) were used to assess working memory and processing speed, respectively. We also assessed verbal ability using Vocabulary Test 2 from the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Derman, 1976).
**Motivation.** Two different measures were used as assessments of self-reported motivation to engage in cognitively demanding activities: the 18-item NFC Scale (Cacioppo, Petty, & Kao, 1984) and the 11-item PNS Scale (Neuberg & Newsom, 1993). Both scales relate to motivation, but measure different aspects of the construct, with NFC measuring an individual’s propensity to engage in and enjoy thinking and PNS measuring an individual’s tendency to desire simple structure as opposed to complex or ambiguous situations. Some example items from the NFC are “I like to have the responsibility of handling a situation that requires a lot of thinking” and “I would rather do something that requires little thought than something that is sure to challenge my thinking abilities” (reverse-coded). Example items from the PNS include “I enjoy having a clear and structured way of life” and “I enjoy being spontaneous” (reverse-coded).

**Activity engagement.** We assessed the degree to which participants engaged in different types of activities using a modified version of the Victoria Longitudinal Study Activity Questionnaire (VLSAQ; Jopp & Hertzog, 2010). At each time of assessment, participants were asked to report the frequency with which they engaged in 28 different activities over the past two years. Each activity fell into one of the following 7 activity categories: social (e.g., “I visit relatives, friends or neighbors.”), technical (e.g., “I use software on a personal computer for communication and other household-related tasks like finance, word-processing, and internet browsing.”), experiential (e.g., “I read books or magazines for leisure.”), developmental (e.g., “I engage in creative writing, writing poems, writing newspaper articles, etc.”), physical (e.g., “I do aerobics or engage in exercise activities.”), games (e.g., “I play board or chess games (for example, chess, checkers, Pinochle, or Bridge.”), and TV (e.g., “I watch comedy or adventure programs on television.”), with four items in each category. We selected these categories because
Jopp and Hertzog found that they vary in their relationship with cognitive ability, with some involving low or negative associations (e.g., TV activities) and others involving stronger positive associations (e.g., technical activities). We assume that the cognitive demands associated with an activity is reflected in the association between engagement and ability. In addition, we selected the four activities that loaded most highly on each activity factor in that same study. Participants reported their frequency of engaging in each activity on a scale of 0 (Never) to 9 (Daily). We created mean scores for each activity category by calculating the mean engagement level of the four representative items.

**Analytic Plan**

Given our repeated assessments of constructs at different points in time within different individuals, we used multilevel modeling (MLM)—which allows for examination of change between and within individuals and accounts for variation in the number of and time between assessments (Raudenbush & Bryk, 2002)—to analyze the data. However, we were also interested in a number of constructs for which we have more than one measurement, and consequently we needed to incorporate latent variables into our multilevel models. Therefore, we utilized multilevel structural equation modeling (MSEM), which is an established way of examining latent variables and their direct and indirect effects at different levels of nesting (Mehta & Neale, 2005). Importantly, MLM and MSEM allow for different numbers of observations as well as observations with varying time intervals, making these methods appropriate for the analysis of our dataset.

Before conducting our analyses, we created latent variables for emotional health (SF-36 mental subscale, GDS, PA, NA), physical health (SF-36 physical subscale, number of chronic conditions), sensory functioning (hearing, sight), cognitive ability (LNS, DSS), and motivation
(NFC, PNS). We decided to keep engagement in individual activities as observed variables, given our interest in how people might select different types of activities as a result of resource and motivation levels. Age as well as vocabulary scores, which was a resource variable not analyzed as part of a latent construct, were standardized in order to facilitate comparisons of coefficients in our models.

In our initial models, we wanted to examine the degree to which change in certain variables (i.e., resource variables; motivation) predicted change in other variables (i.e., motivation, outcome variables), as well as the degree to which these relationships varied as a function of age at Time 1. Thus, linear time served as a Level 1 predictor in all of our models, and baseline age served as a Level 2 predictor.

Level 1 (within-person): \( DV_{it} = \beta_0 + \beta_1 \) (linear change in variable) + \( r_{it} \)

Level 2 (between-person): \( \beta_0 = \gamma_{00} + \gamma_{01} \) (Age) + \( u_0 \)

\( \beta_1 = \gamma_{10} + \gamma_{11} \) (Age)

**Results**

**Descriptive Results: Age and Change Over Time**

In our examination of the intercorrelations between variables at Time 1, we found age-related trends consistent with our expectations (Table 2). Specifically, age was negatively associated with sensory functioning and physical health, but positively associated with emotional health. Regarding ability, age was negatively associated with processing speed and working memory and unrelated to vocabulary. Five of the activity categories were also significantly correlated with age: experiential activity was positively associated with age, whereas physical,
technical, developmental, and social activities were all negatively associated with age. Age was unassociated with years of education or motivation at Time 1.

To determine whether we had sufficient intraindividual variability to perform our multilevel analyses, we conducted unconditional models for each measure. These null models revealed significant ($p < .0001$) levels of both within- and between-person variance in all cases. Percentages of within-person variance are reported in the last column of Table 2, with these estimates ranging from 21.9% to 46.5%. Importantly for our purposes, these results indicated that all variables fluctuated within person over time.

The results of our analyses examining linear change over time and its relation to age are presented in Table 3. Physical health was negatively associated with age and declined over time, whereas emotional health was positively related to age and improved over time. There were also interactions between baseline age and linear time predicting emotional and physical health. Analyses within age groups revealed significant increases in emotional health ($B = .25, p < .001$) and decreases in physical health ($B = -.24, p < .001$) for older adults. For young adults, there was no systematic change over time in emotional health ($B = .03, p = .31$), but similar to older adults, there were significant declines in physical health ($B = -.41, p < .001$). Sensory functioning tended to decrease over time, and a significant effect of baseline age indicated that, as expected, older adults had more problems than young adults. A linear time by baseline age interaction revealed significant declines in sensory functioning over time for older adults ($B = -.17, p < .001$) but only a trending decline for young adults ($B = -.14, p = .06$).

Regarding cognitive ability, vocabulary scores increased over time and there were no significant effects associated with baseline age. Decomposition of the linear time by baseline age interaction revealed trending increases in vocabulary scores over time for older adults ($B = .08, p$
= .05), but not for young adults \((B = .02, p = .38)\). Cognitive ability decreased over time. As expected, younger age at baseline was associated with higher cognitive ability scores, and a significant baseline age by linear time interaction was present, indicating improvements over time for younger \((B = .81, p < .001)\), but decreases over time for older adults \((B = -.23, p < .001)\).

Engagement in technical, developmental, experiential, and social activities tended to increase over time, whereas engagement in TV activities decreased. There were also significant age differences in activity engagement, with younger adults engaging in physical, technical, and developmental activities more than older adults, and older adults engaging in experiential activities more than young adults. Significant baseline age by linear time interactions were present for technical, developmental, experiential, and social activities. Analyses within age group revealed that only older adults had significant increases in technical \((B = .12, p < .001)\), developmental \((B = .19, p < .001)\), experiential \((B = .09, p = .02)\), and social \((B = .16, p < .001)\) activities over time. Regarding motivation, there tended to be increases over time, but no significant effects associated with age at baseline.

**Resources Predicting Motivation**

In order to decide which theoretical models of various resources and outcomes to examine in concert with motivation as a mediator, we first examined the degree to which changes in each resource predicted changes in motivation. We found that improvements in emotional health predicted increases in motivation, and changes in sensory functioning also positively predicted changes in motivation. Changes in physical health, vocabulary scores, and cognitive ability were not associated with changes in motivation, but a positive trend was present with cognitive ability as a predictor. We then added baseline age as a level 2 predictor along with its cross-level interaction with linear change in each predictor variable. Baseline age significantly
interacted with linear changes in physical health, emotional health, sensory functioning, and vocabulary to predict changes in motivation. Results are displayed in Table 4. To decompose these interactions, we examined effects within the older and young adults separately and found that changes in emotional health and sensory functioning predicted changes in motivation for older adults ($B = .87, p = .01; B = .85, p < .001$, respectively) but not young adults ($B = .09, p = .45; B = -.24, p = .27$, respectively). Additionally, decreases in physical health predicted increases in motivation for young adults ($B = -.82, p = .006$) but not older adults ($B = -.25, p = .27$). Although a significant cross-level interaction was present for our model with vocabulary predicting motivation, age group-specific models revealed no significant trends with young ($B = -.29, p = .35$) or older adults ($B = .66, p = .12$), although a clear trend was evident in the association being positive in the latter group.

**Motivation Predicting Activity Engagement**

We next identified activity categories for which changes in motivation predicted changes in activity engagement (Table 4). Changes in motivation positively predicted changes in technical, developmental, experiential, and social activities, and negatively predicted changes in TV activities. There were no significant relationships between changes in motivation and changes in physical and game activities. When including baseline age and its cross-level interaction with motivation as predictors, we found that baseline age interacted with linear changes in motivation to predict changes in technical, developmental, experiential, and social activity engagement. To decompose these interactions, we examined effects within the young and older adult age groups and found changes in motivation to predict changes developmental ($B = .93, p < .001$) and experiential ($B = .76, p = .04$) activity engagement only for older adults. Changes in motivation predicted changes in technical and social activity engagement for both
groups, but effects were significant for older adults (technical: $B = .85, p = .03$; social: $B = .97, p < .001$) and only trending for young adults (technical: $B = .66, p = .05$; social: $B = .40, p = .08$).

Increases in motivation significantly predicted decreases in TV activities for young adults ($B = -.74, p = .001$), but not for older adults ($B = -.36, p = .21$).

**Motivation Predicting Cognitive Ability**

In our examination of cognitive ability as an outcome, we ran one model with changes in motivation predicting changes in vocabulary, and another predicting changes in the cognitive ability latent construct. Changes in motivation did not predict changes in vocabulary scores, but did predict changes in cognitive ability (see Table 5). There was also a significant motivation by baseline age interaction predicting cognitive ability. Decomposition of this interactions revealed effects specific to older adults, with this age group demonstrating positive associations between change in motivation and change in cognitive ability ($B = .77, p = .007$), but young adults demonstrating no trend or significant effect ($B = .23, p = .35$).

**Mediation**

For our final series of analyses testing for mediation, we followed an MSEM framework suggested by Preacher, Zyphur, and Zhang (2010), with some slight modifications which were necessary to accommodate the structure of our data. On the within-level, we regressed the previously described latent variables on linear time, with multiple indicators for various resources and motivation variables. On the between-level, we specified our mediation model with varying slopes, and computed the within-indirect effect using the following equation: $indw = aw \times bw + cab$, where $aw$ represents linear change in the mediator regressed on linear change in
the predictor variable, \( bw \) represents linear change in the outcome variable regressed on linear change in the mediator, and \( cab \) represents the Level 2 covariances of \( aw \) and \( bw \).

As noted previously, this approach is ideal for examining multilevel mediation in our data because, unlike with traditional MLM, MSEM allows for the specification of latent variables using multiple observed indicators. We were also able to allow the associated loadings on these variables to vary between person by examining them as random effects. Additionally, we were able to examine models using random slopes as mediators and independent variables, as well as dependent variables, which we would be unable to do using traditional MLM (Dagne, Brown, & Howe, 2007).

Importantly, we only tested mediation models associated with pathways for which changes in resources significantly predicted changes in motivation and changes in motivation significantly predicted changes in outcomes. Although we were interested in examining baseline age as a Level 2 predictor, adding the associated cross-level interactions to our models yielded a variety of errors, leading us to take an alternative approach to examine the role of age. Specifically, we ran models with our entire sample, only young adults, or only older adults depending upon previously determined significant pathways. That is, we ran models with our entire sample examining emotional health and sensory functioning as predictors and cognitive ability, technical activities, developmental activities, experiential activities, social activities, and TV activities as outcomes. Next, we ran the aforementioned models with only older adults (with the exception of TV activities as an outcome), because despite significant effects in the sample as a whole, within-age group analyses revealed that these effects were driven by older adults. Lastly, we examined models only for young adults using physical health as a predictor and technical, social, and TV activities as outcomes. Despite the significant interaction between
linear change in vocabulary and baseline age predicting linear change in motivation, we did not include vocabulary as a predictor in these models because it was not a significant predictor within the whole sample or either age group. Importantly, although there are currently no guidelines regarding sample size within this mediation context, our new samples of either 125 or 183 individuals follow the recommendations of precursor MSEM methods which suggest at least 100 clusters (Hox & Maas, 2001) or at least 50 to 100 clusters (Muthén, 1989).

**Activity engagement as outcome.** We first tested models examining linear change in activity engagement as outcomes. Indirect effects for each model are presented in Table 6. Our full-sample analyses revealed that changes in motivation mediated the relationship between changes in emotional health and changes in engagement in social activities. Mediation was not present in any other full-sample models. We then ran mediation within older adults with models examining changes in emotional health as a predictor and found that changes in motivation significantly mediating the relationship between changes in emotional health and changes in technical, developmental, experiential, and social activity engagement. Next, we ran similar models within the older adult sample examining changes in sensory functioning as a predictor and found that changes in motivation mediated the relationship between changes in sensory functioning and changes in technical and developmental activity engagement. Lastly, we ran models with the young adult sample examining changes in physical health as a predictor, and changes in technical, social, and TV activities as outcomes, and found no significant mediation in any of the three models.

**Cognitive ability as outcome.** In our final set of analyses, we were interested in whether cognitive ability, although conceptualized as a resource, might serve as an outcome rather than a predictor in models involving changes in other resources and motivation. Thus, we ran models
examining whether changes in motivation might mediate the relationship between changes in resources and changes in cognitive ability. Neither the model with emotional health nor sensory functioning as resources yielded significant mediation when examined within the full sample. However, within older adults, changes in motivation served as a mediator for both models with emotional health and sensory functioning as resources. Results are presented in Table 6.

Discussion

In the present study, we examined the interrelationships between longitudinal changes in personal resources, motivation, and engagement with the specific goal of better understanding the factors that determine older adults’ willingness to engage in cognitively demanding, but potentially beneficial activities. Based on predictions derived both from SET (Hess, 2014) and from previous empirical work (e.g., Hess et al., 2012; Queen & Hess, 2018), we examined three specific hypotheses.

First, we hypothesized that changes in resources would influence the motivation to engage cognitive resources, resulting in selective engagement in everyday activities based upon the cognitive demands of those activities. Secondly, we hypothesized that this mediation of changes in resources on activity by motivation would be stronger in older adults. Using physical health, emotional health, sensory functioning, and cognitive ability as resources predicting seven different activity categories of varying levels of demands as outcomes, we obtained partial support for our hypotheses. Specifically, mediation effects were observed involving the personal resources of emotional health and sensory and four different categories of activity (technical, developmental, experiential, and social). Two specific aspects of these findings were particularly relevant to the current theoretical framework. First, the observed mediation effects were stronger in older than in younger adults. Within older adults only, longitudinal assessments of motivation
mediated the relationship between emotional health and engagement in four types of activities (technical, developmental, experiential, and social), as well as between sensory functioning and two types of activities (technical and developmental). This age specificity may reflect the relatively greater demands associated with dealing with negative aspects of functioning associated with resources (e.g., difficulty hearing and seeing) due to normative declines in cognitive resources in later life. The second notable finding was that the activities for which mediation was observed are relatively demanding of resources compared to those activities for which it was not observed. These assumptions about demands are based on associations between ability and activity reported by Jopp and Hertzog (2010). For example, they found that engagement in technical activities had consistently strong positive correlations with a variety of ability measures, whereas the relatively passive activity of watching TV had low or negative associations with ability. This differential mediation across activity categories is consistent with the SET prediction that motivation-based selection effects reflect, in part, the demands of the specific activity. And in line with our expectations, this selective engagement was present to a greater extent in older adults than young adults.

Our third hypothesis was aimed at testing whether cognitive performance, as measured by our laboratory assessments of working memory and processing speed, would serve as an outcome predicted by changes in resources and motivation. The items on our latent variable of motivation were specifically related to motivation to engage resources in cognitively demanding activities, so one might expect this motivation to be predicted by cognitive ability. However, based on previous research (Hess et al., 2012), we predicted that cognitive ability would be better modeled as an outcome than a resource in our models. We replicated these previous findings and found that within older adults, cognitive performance did not significantly predict motivation but
was a significant outcome in models with longitudinal assessments of motivation mediating the relationship between both sensory functioning and emotional health and performance. This interesting finding provides further support for the idea that performance on laboratory tests may rely heavily on motivation to engage cognitive resources, which in turn may rely on a variety of personal resources aside from cognitive ability. Findings in the present study suggest that this motivation may be particularly consequential for older adults’ performance on cognitive tests, as motivation did not predict cognitive tests scores within young adults. Although somewhat speculative, one implication of these findings is that, relative to younger adults, motivational factors play a larger role in determining performance on standard cognitive assessments, resulting in potentially inflated estimates of adults age differences in ability.

Although there was no significant mediation for any of the models examining only young adults, analyses examining individual pathways replicated previous findings of a negative association between physical health and motivation for this age group (Hess et al., 2012). One possible explanation is that young adults who are not physically well may prefer to spend time engaging in cognitively demanding activities as opposed to physical activities. However, this motivation to engage cognitive resources did not mediate relationships between physical health and engagement in technical, social, or TV activities when tested as a full model.

Our results provide support for SET in a number of ways. SET assumes that resources affect the costs associated with engaging in activities, and as costs increase with age we become more selective about the activities in which we engage. In line with this expectation, our longitudinal assessments of two different resources were positively associated with motivation and engagement in demanding activities. The older adults in this study tended to experience decreases in sensory functioning over time and increases in emotional health over time, which is
consistent with aging-related trends in these resources (e.g., sensory functioning: Crews & Campbell, 2001; Gorman & Lin, 2016; Horowitz, Brennan, & Reinhardt, 2005; emotional health: Cacioppo et al., 2008; Henderson et al., 1998; Stawski, Sliwinski, Almeida, & Smyth, 2008). According to SET, declines in resources such as sensory functioning increase the demands associated with activity engagement, which should then affect selectivity through changes in motivation. Impaired sensory functioning in older adulthood has been associated with depression (Kee-Lee, 2008), cognitive decline (Curhan, Willett, Goldstein, & Curhan, 2019), low performance on laboratory cognitive tasks (Wingfield, Tun, & McCoy, 2006), difficulties with activities of daily living (Brennan, Horowitz, & Su (2005), and low levels of activity participation (Crews & Campbell, 2001). Our results suggest that changes in motivation which result from deteriorating sensory functioning may be partially responsible for these relationships.

A novel aspect of the present study as the examination of emotional health as a resource that does not tend to decrease with age, allowing us to apply SET to protective factors as well as declines. It may be the case that those who maintain high levels of or experience increases in emotional health with older age can draw upon this as a resource for maintaining engagement in demanding activities. On the other hand, those experiencing a strain on their emotional resources may in turn have higher costs that affect their willingness to engage in a number of different activities. Of particular note, emotional health was associated with motivation to engage in activities that are demanding of cognitive resources as well as emotional resources. For example, changes in emotional was associated with changes in technical activity engagement through changes in motivation. This indicates that emotional health may influence perceptions of the demands associated with cognitive activities. Alternatively, it has been suggested that individuals who have abundant emotional resources may simply experience high levels of enjoyment when
engaging their cognitive resources (Strobel, Anacker, & Strobel, 2017). To the extent that various resources influence motivation, we should consider a broad array of resources when examining factors associated with activity engagement in older adulthood.

We were somewhat surprised that physical health did not play a stronger role in predicting motivation and activity engagement, thereby not replicating results from previous studies (e.g., Queen & Hess, 2018). One possible reason for this may have to do with selection effects in our sample. Specifically, data used in the present set of analyses was collected from individuals who volunteered on repeated occasions to participate in research by coming to our lab. In contrast to the individuals in the HRS data used by Queen and Hess, these individuals had not volunteered to be in an on-going prospective study, and thus their willingness to participate may have in part been based on their current health status.

Our findings also have implications for better understanding the ways in which adaptive functioning can be promoted for older adults. We found that motivation played a key role in influencing older adults’ activity engagement and confirmed that there is intra-individual variability in motivation, indicating a potential for intentional modification. Change in motivation was in turn most influenced by change in emotional health. This connection between emotional resources and motivation as indicated by PNS and NFC is consistent with previous findings, with PNS being associated with anxiety (Neuberg & Newsom, 1993; Sollár, 2008), and NFC being associated with low levels of anxiety and depression (e.g., Bertrams & Dickhäuser, 2012; Reeves, Watson, Ramsey, & Morris, 1995) as well as high levels of positive affect and low levels of negative affect (Fleischhauer et al., 2010). In the present study we found this pattern longitudinally, and then found associations between change in motivation and change in activity engagement. Thus, one possibility is that enhancing older adults’ emotional health may
contribute to maintained or increased engagement in demanding but beneficial activities, and interventions aimed at encouraging this kind of engagement should potentially consider factors relating to emotional resources (Growney & Hess, 2017, 2019). Whereas most interventions examining activity engagement in older adulthood are focused on the associated positive outcomes, examination and targeting of the modifiable resources that may influence activity engagement remains relatively unexplored.

We acknowledge several limitations associated with this study. First, as noted before, our sample may be biased as a result of selection effects. Specifically, the participants whose data contributed to our final dataset did not commit to participating in a longitudinal study. Rather, they made the decision to participate in a number of individual studies in our lab and thus may have higher levels of intrinsic motivation to engage in cognitively demanding activities than the typical individual. In line with this supposition, participants in the present study tended to exhibit increases in motivation over time. As this may have led us to underestimate the role of motivation in the present study, it is notable that we still found significant results. The unplanned nature of this study also led to unbalanced data as a result of participants varying in the number of times they participated in a study and the time intervals associated with participation. However, we were able to account for this statistically with MSEM. Lastly, our sample had an extreme age groups design with no participants between ages 43 and 60 at Time 1. Thus, we cannot make conclusions about the longitudinal nature of our variables of interest during middle adulthood.

In conclusion, the present study provides additional evidence for the importance of motivation in the relationships associated with cognitive change in older adulthood. We also identified emotional health as a particularly important resource that may be closely tied to
motivation to engage one’s resources in cognitively demanding activities. We suggest that a more expansive view of resources may be necessary in order to truly understand the factors involved with motivation to be cognitively engaged throughout older adulthood.
References


Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-


doi:10.1037/a0017662


doi:10.1037/a0020141


Table 1. Participant characteristics and measures (M, SD) at Time 1 for young and older adults.

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<th>Young Adults</th>
<th>Older Adults</th>
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<td><strong>N</strong></td>
<td>125</td>
<td>183</td>
</tr>
<tr>
<td>% Female*</td>
<td>56.0</td>
<td>49.2</td>
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<td>Age*</td>
<td>31.55 (5.52)</td>
<td>71.48 (5.28)</td>
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<td>Years of Education</td>
<td>16.21 (1.97)</td>
<td>16.57 (2.42)</td>
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<tr>
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<tr>
<td>Need for Cognition</td>
<td>4.04 (0.73)</td>
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<td>Need for Structure</td>
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<tr>
<td>Hearing*</td>
<td>4.23 (0.76)</td>
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<tr>
<td>Sight*</td>
<td>4.10 (0.84)</td>
<td>3.78 (0.79)</td>
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<tr>
<td>SF-36 Physical Subscale*</td>
<td>50.99 (4.59)</td>
<td>45.93 (7.53)</td>
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<tr>
<td>Number of Chronic Conditions*</td>
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<td>1.41 (1.15)</td>
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*p < .05
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. TV</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 2. Intercorrelations between variables at first time of measurement and percentage of within-subject variance across participants and measurement occasions

*\(p < .05\), **\(p < .01\), ***\(p < .001\)
Table 3. Standardized results of multilevel analyses examining linear change in time, baseline age, and their interaction predicting study variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Linear time</th>
<th></th>
<th>Baseline Age</th>
<th></th>
<th>Baseline Age x Linear Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>p</td>
<td>Coefficient</td>
<td>p</td>
<td>Coefficient</td>
<td>p</td>
</tr>
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<td>.02</td>
<td>.06</td>
<td>.23</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
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<td>-.51</td>
<td>&lt;.001</td>
<td>-.18</td>
<td>&lt;.001</td>
</tr>
<tr>
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<td>&lt;.001</td>
<td>.30</td>
<td>&lt;.001</td>
<td>.14</td>
<td>&lt;.001</td>
</tr>
<tr>
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<td>&lt;.001</td>
<td>-.52</td>
<td>&lt;.001</td>
<td>-.11</td>
<td>&lt;.001</td>
</tr>
<tr>
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<td>-.93</td>
<td>&lt;.001</td>
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<td>.18</td>
</tr>
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<td>.12</td>
<td>.17</td>
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<td>.02</td>
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<tr>
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<td>.49</td>
<td>-.32</td>
<td>&lt;.001</td>
<td>.01</td>
<td>.38</td>
</tr>
<tr>
<td>Technical activities</td>
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<td>&lt;.001</td>
<td>-.41</td>
<td>&lt;.001</td>
<td>.16</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Developmental activities</td>
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<td>.01</td>
<td>-.28</td>
<td>&lt;.001</td>
<td>.10</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Experiential activities</td>
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<td>.01</td>
<td>.53</td>
<td>&lt;.001</td>
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<td>.03</td>
</tr>
<tr>
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<td>-.001</td>
<td>.50</td>
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</tr>
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<td>.05</td>
<td>-.15</td>
<td>.10</td>
<td>-.02</td>
<td>.31</td>
</tr>
<tr>
<td>TV activities</td>
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<td>&lt;.001</td>
<td>.10</td>
<td>.18</td>
<td>.14</td>
<td>.19</td>
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</table>
Table 4. Standardized results of multilevel analyses examining linear change in resource variables, baseline age, and their interaction predicting linear change in motivation.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Effect</th>
<th>Linear Time</th>
<th>Baseline Age</th>
<th>Baseline Age X Linear Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
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<td>Coefficient</td>
<td>p</td>
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<td>.004</td>
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<td>.001</td>
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<td>.001</td>
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<td>.004</td>
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<td>.38</td>
<td>.41</td>
<td>.01</td>
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</table>
Table 5. Standardized results of multilevel analyses of linear change in motivation, baseline age, and their interaction predicting linear change in outcomes

<table>
<thead>
<tr>
<th>Effect</th>
<th>Linear Time</th>
<th>Baseline Age</th>
<th>Baseline Age X Linear Time</th>
</tr>
</thead>
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<tr>
<td>Outcome</td>
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<td>Coefficient</td>
</tr>
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<td>Activity Engagement</td>
<td></td>
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<td></td>
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<tr>
<td>Physical</td>
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<td>.32</td>
<td>-.10</td>
</tr>
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</tr>
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<td>Developmental</td>
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<td>.001</td>
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<td>Experiential</td>
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<td>Social</td>
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<td>Game</td>
<td>.14</td>
<td>.35</td>
<td>-.48</td>
</tr>
<tr>
<td>TV</td>
<td>-.73</td>
<td>.01</td>
<td>.08</td>
</tr>
<tr>
<td>Cognitive Ability</td>
<td>.74</td>
<td>.01</td>
<td>-.69</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>.14</td>
<td>.38</td>
<td>.24</td>
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</table>
Table 6. *Unstandardized results of mediation analyses examining changes in motivation* mediating resource-related changes in outcomes

<table>
<thead>
<tr>
<th>Model</th>
<th>Indirect Effect</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Sample</strong></td>
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</tr>
<tr>
<td>Emotional Health → Motivation → Technical Activities</td>
<td>-0.03</td>
<td>1.28</td>
</tr>
<tr>
<td>Emotional Health → Motivation → Developmental Activities</td>
<td>0.22</td>
<td>2.27</td>
</tr>
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<td>Emotional Health → Motivation → Experiential Activities</td>
<td>0.10</td>
<td>4.36</td>
</tr>
<tr>
<td>Emotional Health → Motivation → Social Activities</td>
<td>0.89**</td>
<td>0.13</td>
</tr>
<tr>
<td>Emotional Health → Motivation → TV Activities</td>
<td>-0.03</td>
<td>1.28</td>
</tr>
<tr>
<td>Emotional Health → Motivation → Cognitive Ability</td>
<td>0.12</td>
<td>0.40</td>
</tr>
<tr>
<td>Sensory Functioning → Motivation → Technical Activities</td>
<td>0.06</td>
<td>1.41</td>
</tr>
<tr>
<td>Sensory Functioning → Motivation → Developmental Activities</td>
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<td>1.34</td>
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<td>7.68</td>
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<td>Sensory Functioning → Motivation → Cognitive Ability</td>
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<td><strong>Older Adults</strong></td>
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<tr>
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<td>1.40</td>
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<tr>
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</tr>
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<td>0.06</td>
</tr>
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<td>1.05</td>
</tr>
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<td>1.66</td>
<td>2.08</td>
</tr>
<tr>
<td>Sensory Functioning → Motivation → Social Activities</td>
<td>1.62</td>
<td>1.41</td>
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<tr>
<td>Sensory Functioning → Motivation → TV Activities</td>
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<td>8.27</td>
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<td>Sensory Functioning → Motivation → Cognitive Ability</td>
<td>2.20**</td>
<td>0.54</td>
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<tr>
<td><strong>Young Adults</strong></td>
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<td></td>
</tr>
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<td>-0.02</td>
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</tr>
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<td>Physical Health → Motivation → Social Activities</td>
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<td>0.11</td>
</tr>
<tr>
<td>Physical Health → Motivation → TV Activities</td>
<td>-0.01</td>
<td>0.24</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001*
Figure 1. Conceptual model of motivation mediating the relationship between resources (i.e., physical health, emotional health, sensory functioning, and cognitive ability) and activity engagement. The model was individually tested for each activity category.
General Discussion

Summary of findings

The three manuscripts that make up this dissertation share a common theme: affect-based resources are consequential in older adulthood. The first two manuscripts build upon each other and explore the theme in experimental settings, whereas the third manuscript involves longitudinal assessments of emotional health as an affect-based resource. Here I briefly summarize the methods and findings of the three manuscripts.

In the first manuscript (Growney & Hess, 2017), we sought to investigate whether mood might serve as a resource for older adults, encouraging them to attend to negative information when it is adaptive to do so. We manipulated participants’ mood by having them reflect on a situation in which they experienced a cognitive success or failure and their feelings associated with the incident. After the manipulation, participants were presented with options to view feedback about their strengths and/or weaknesses on a previously completed cognitive task. Older adults who completed the positive reflection task were more willing to consider their weaknesses than older adults who completed the negative reflection task, suggesting that the older adults used mood as a resource. However, the nature of our manipulation task left the specifics of the underlying mechanism as an open question.

The goals of the second manuscript (Growney & Hess, 2019a) were to (a) replicate the findings of the first paper, (b) identify a mechanism underlying the effects found in the first manuscript, and (c) apply ideas from the first manuscript to a new context. We manipulated participants’ general mood or health behavior perceptions, depending upon condition, and then presented them with a list of positive and negative, but informative health-related articles to select and read. Older adults in the positive health-behavior perception condition selected more
negative articles than older adults in the negative health-behavior perception condition, but there were no differences in preferences associated with the general mood manipulation. This suggests that the effect was not due to mood, but a mood-based resource (i.e., positive self-perceptions in the domain of interest). Information goal priorities mediated the relationship between health-behavior perceptions and article selections. In a follow-up study, we found that the article headlines needed to be informative in order for the effect to be present. The findings of the third paper are also consistent with the conclusions of the first two manuscripts.

In the third manuscript (Growney & Hess, 2019b), we investigated longitudinal relationships between personal resources, motivation, and engagement in activities of varying demands. Notably, we expanded our view of personal resources to include physical health, emotional health, sensory functioning, and cognitive ability. Changes in motivation mediated the relationship between changes in two different types of resources (i.e., sensory functioning and emotional health) and changes in activity engagement. Selectivity was present in that changes in motivation mediated the relationship between changes in emotional health and changes in activity engagement specifically for activities that are demanding of resources (i.e., technical, developmental, experiential, and social activities, as well as performance on laboratory tests of cognitive ability). Like in the experimental studies, findings from the longitudinal study suggest that affect-based resources may be particularly important in older adulthood, contributing to willingness to engage one’s resources in demanding activities.

**Theoretical Contexts**

These findings broadly relate to the Mood as Resource framework (Trope et al., 2006), Socioemotional Selectivity Theory (Carstensen et al., 1999), and Selective Engagement Theory (Hess, 2014), and have implications for each.
**Mood as Resource.** The Mood as Resource framework proposed by Trope and colleagues (2001) suggests that when individuals are in a positive mood, their positivity may serve as a buffer against the negative consequences of exposing oneself to negative information. Thus, when feeling good, individuals should be more willing to receive feedback about their weaknesses or read general negative information, as they are proposed to be less focused on mood-repair if they are already feeling positive. In the first two manuscripts (Growney & Hess, 2017, 2019a) older adults’ behavioral results were consistent with the expectations of the framework, with older adults who felt positive in a particular domain being more willing to attend to negative information. Although we demonstrated that the Mood as Resource framework can be applied to older adults, with whom these ideas had not yet been explored, the absence of effects for young adults was inconsistent with the expectations of the framework. Potential explanations for this are discussed in the limitations section below.

One of the significant limitations of the Mood as Resource framework is the lack of clarity in the mechanisms underlying the behavioral findings beyond the idea that mood influences behavior. In the second manuscript (Growney & Hess, 2019a), we identify health behavior perceptions as a mood-based resource that may have influenced behavior, as opposed to general mood. Additionally, our measure of information goal priorities mediated the relationship between health behavior perceptions and interest in negative health-related articles. Similarly, in the first manuscript (Growney & Hess, 2017), there was a correlation between the degree to which information goals were prioritized over emotion goals and negative feedback viewing for older adults. Thus, we suggest that self-perceptions in the domain of information to be gathered influence goal priorities relating to information gathering, which in turn influence interest in negative information.
The Mood as Resource framework specifies that mood should only serve as a resource in situations where the information is viewed as valuable and useful to the individual (e.g., Trope & Gervey, 2000; Raghunathan & Trope, 2000). We found this to be the case in older adults in Study 2 of the second manuscript, with those who felt good about their health behaviors being more interested in reading negative health-related articles than those who felt bad about their health behaviors, only in conditions where the headlines made it clear that the article offered useful information. This finding was unsurprising considering research calling attention to the importance of task relevance in older adults’ motivation to engage (e.g., Hess, Queen, & Ennis, 2012).

In the third manuscript (Grownney & Hess, 2019b), rather than examining mood states as a resource, we examine long-term trends in emotional health as a resource. We did not explicitly measure participants’ perceptions of the demands associated with each of the activity categories assessed in the study, but one possibility derived from the Mood as Resource perspective is that individuals’ emotional health served as a buffer against the perceived negative immediate consequences of expending cognitive resources in a difficult activity. That is, it may be the case that individuals with high or increasing levels of emotional health also had high or increasing levels of their self-perceptions regarding ability to engage in demanding activities, leading them to be more willing to undergo the negative experience of potential failure or strain on their cognitive resources.

**Socioemotional Selectivity Theory.** According to Socioemotional Selectivity Theory (SST; Carstensen et al., 1999), changes in one’s future time perspective occur throughout the lifespan and influence goal priorities, which in turn influence behavior. The theory suggests that young adults, who have an expansive view of their time left on earth, are focused on gathering
information for later use, and as a result may be more willing to expose themselves to negative information if it is seen as valuable. Older adults, on the other hand, have a limited view of their future time, which according to SST may cause them to prioritize maintaining emotional well-being in the present time and focus disproportionately on positive information and interactions as a result. Behavioral results from the first two manuscripts partially support the theory. In the first manuscript (Growney & Hess, 2017), young adults viewed more weaknesses about their cognitive test performances than older adults did, but this was only the case for older adults in the negative condition, who reflected on a negative experience related to their own cognition.

Similarly, in the second manuscript (Growney & Hess, 2019b), young adults were more interested in negative informative health articles than older adults were, but relatively low levels of negative interest were only present in older adults who were made to feel negative about their health behaviors. To summarize, the behavioral expectations of SST were only observed in situations where older adults had negative self-perceptions in the domain of information to be gathered. Notably, older adults who were made to feel good about their health behaviors actually had higher levels of interest in negative health-related articles than young adults (Growney & Hess, 2019b), which would appear to go against the suggestion that older adults will be motivated to maintain positive emotional states. Results of the first two manuscripts suggest that self-perceptions in a relevant domain may moderate the sometimes-observed bias toward positive information, representing a context in which older adults may be willing to focus on negative information without specific constraints on processing systems.

Although goal priorities relating to SST had not been explicitly measured before our first manuscript, SST suggests that certain goals are dominant during different points of the lifespan. Specifically, the theory proposes that very early in life as well as later on in life, individuals are
focused on maintaining emotional well-being, whereas goals related to information gathering are dominant from adolescence through mid-life. However, we did not observe this pattern in either of our manuscripts which measured self-reported goal priorities using the Goal Prioritization Inventory we created (Grownery & Hess, 2017, 2019a). Instead, we observed no difference in the degree to which young and older adults endorsed emotion-regulation goals, with a ceiling effect being present in both groups. Consistent with SST, young adults tended to endorse information gathering goals to a greater extent than older adults. Whereas previous research has demonstrated that older adults’ behavior can be changed by instructing them to take on specific goal priorities (e.g., Löckenhoff & Carstensen, 2007), in our studies we demonstrate that older adults’ information-gathering goals may be enhanced through exposure to positive experiences prior to gathering information.

To the extent that older adults’ supposed prioritization of emotional goals over informational goals contributes to high levels of emotional well-being and mental health, results from the third manuscript may indicate some of the associated benefits. Namely, improvements in emotional health were associated with increased motivation to engage resources in cognitively challenging activities that may benefit cognitive health in the long-term. Although we did not make any connections between emotion-focused goals and emotional health, such goal priorities are certainly an avenue through which emotional resources may be attained.

Selective Engagement Theory. Selective Engagement Theory (SET; Hess, 2014) focuses on the ways in which resources and motivation contribute to engagement throughout adulthood. The theory proposes that as resources decrease with age, older adults experience increases in the costs associated with engaging their limited resources in activities. As a result, older adults may experience decreases in their motivation to engage their resources, which in
turn leads them to be selective about the activities in which they choose to engage. The theory suggests that task relevance is an influential factor in determining older adults’ willingness to engage, which is consistent with the aforementioned findings from Study 2 of the second manuscript. The manuscripts in this dissertation also explore SET in a novel way, examining a type of resource that does not tend to decline with age: emotional health.

Acknowledging that attending to one’s weaknesses on a cognitive task as well as negative health-related information is demanding of both cognitive and emotional resources, findings from the first two manuscripts (Growney & Hess, 2017, 2019a) can be viewed under the lens of SET. Those who were made to feel bad about their cognitive abilities or health behaviors were placed in a situation where their emotional resources were limited, albeit temporarily. On the other hand, those who were made to feel good about themselves within the domain of interest may have experienced levels of emotional resources that were higher than their norm. The subsequent behavior of these individuals was indicative of selectivity in that they were respectively less or more willing to dedicate emotional and cognitive resources towards better understanding their cognitive weaknesses or learning about negative health-related topics.

Although we did not measure motivation to engage cognitive resources in either of the first two manuscripts, our measure of information-gathering goal priorities may be akin to motivation. Moreover, similar to the way in which motivation served as a mediator of the relationship between emotional resources and activity engagement (Growney & Hess, 2019b), information goal priorities mediated the relationship between health-behavior perceptions and interest in reading negative health-related articles.

Testing the assumptions of SET was one of the main goals of the third manuscript (Growney & Hess, 2019b). Results provided support for the tenets of SET, with changes in
sensory functioning and emotional health each being associated with changes in motivation to engage cognitive resources. Additionally, changes in motivation were associated with changes in activity engagement indicating selectivity. Specifically, increases in motivation were significantly associated with increases in activities that are demanding (technical, developmental, experiential, social activities, and performance on laboratory cognitive tests), but decreases in activities that are low in demands (TV watching). Importantly, mediation analyses revealed that motivation played a key role in the relationship between resources and activity engagement, and these relationships were specific to older adults or stronger in older than young adults. In sum, results from the third manuscript provide support for SET, call attention to the multidirectionality of resources throughout the lifespan, and encourage consideration of a wider array of personal resources in the future.

**Limitations**

A number of limitations specific to each manuscript have been addressed in earlier sections of this dissertation. Here, I will discuss three additional caveats that are common to at least two of the manuscripts: the possibility that we failed to successfully manipulate relevant constructs within young adults, our lack of control conditions, and the absence of middle-aged individuals from these studies.

In the first two manuscripts, we did not find evidence to suggest that young adults benefitted from mood-based resources similar to the ways in which older adults did in our studies. As this is inconsistent with previous research finding evidence for the Mood as Resource phenomenon in young adults, we were led to consider potential reasons for our inability to replicate these effects. The most compelling possibility is that we simply did not manipulate young adults’ mood-based resources to the extent that we manipulated older adults’ mood-based
resources. In the first manuscript, participants wrote about cognitive successes or failures. Examination of the written responses revealed that whereas older adults in the negative condition tended to voice concern about their declining cognitive abilities, most young adults in the negative condition described situations where they got a bad grade on a college test or assignment. Young adults tended to end their writing sample in one of two ways: (1) pushing responsibility for the failure onto someone else such as a professor or group member or (2) expressing motivation and intentions to do better next time. The prevalence of these types of endings suggest that young adults’ perceptions of their ability were not greatly affected by the negative recall task. Although we do not have similar qualitative data from the second manuscript, it seems likely that young adults similarly might make excuses for their poor health behaviors or be motivated to improve in the future given the presumed long amount of time they have to improve health-wise. Aside from the possibility that young and older adults’ self-perceptions were not equally manipulated, it is likely that cognitive ability and health behaviors have different places of importance within young and older adults’ self-concepts. Notably, and providing further evidence that mood is not the underlying construct associated with these effects, young and older adults did not differ in the degree to which their general mood was changed as a result of our manipulations in either manuscript. In the future, it would be interesting to compare the degree to which affect-based resources serve as resources for young and older adults in a domain that is similarly meaningful to both groups.

Another limitation of both experimentally based manuscripts relates to the conditions included in each study. Specifically, we neglected to include conditions inducing a neutral mood or neutral feelings about the self in the domain of interest. As a result, it is unclear whether individuals might have interests more in line with those when they have positive or negative self-
perceptions. However, one might argue that neutral feelings about oneself in a particular domain would not be consequential, given that the domain is likely not salient to the individual if he or she does not have a strong self-perception associated with the area of functioning. The Mood as Resource perspective and SST suggest that individuals in general or older adults, respectively, are likely to attend to positive versus negative information if the information to be gathered is not particularly meaningful to them.

Lastly, and common to all three manuscripts, this research is limited by our samples’ demographics. Middle-aged individuals were not included in any of the studies presented in this dissertation, precluding us from making statements about how affect-based resources might become increasingly important across the adult lifespan. Of note, in all three manuscripts we found patterns that differed between young and older adults, indicating that some form of change may occur during midlife regarding the degree to which self-perceptions influence interests in a particular domain in the case of the first two manuscripts, and the degree to which emotional health influences motivation and effortful engagement in case of the third manuscript. I hope to explore the role of affect-based resources in adult-lifespan samples in the future, and treat age as a continuous variable.

Conclusion and Future Directions

The three manuscripts explore the implications of various types of affect-based resources and motivational factors in young and older adults, identifying conditions under which older adults’ motivation to engage in potentially beneficial, but also potentially challenging behaviors might be optimized. For example, regulating negative emotions in response to negative self-relevant information may be challenging and demanding of cognitive resources used to process the information as well as emotional resources. Similarly, participating in a challenging task
requires cognitive resources to carry out the task as well as emotional resources to cope with the possibility of failure. However, attending to negative self-relevant information provides individuals with information necessary for self-improvement, and engaging in demanding tasks may help individuals maintain their cognitive health in later life. The three manuscript’s findings suggest that personal resources such as positive perceptions of oneself in a relevant domain and emotional health in general contribute to older adults’ motivation and behavior in meaningful ways.

There are a number of future directions in which I would like to take this research. First, I am interested in identifying and exploring other affect-based resources that might be useful for older adults that I have not yet examined. These may include emotional regulation skills, emotional self-efficacy, or emotional support from a loved one.

Secondly, I am interested in exploring health contexts that go beyond everyday health behaviors. Specifically, I would like to explore whether affective resources might contribute to older adults’ ability to gather information about and understand a diagnosis, consider and evaluate multiple avenues of treatment, and make the most of their interactions with their healthcare providers. As dealing with a difficult health situation is demanding of older adults’ cognitive and emotional resources, feeling positive about their health or abilities in a particular domain of health may allow for older adults to open themselves up to negative information in a related domain. In this way, they might be able to focus more on the health information and less on improving their affective state or self-view.

Lastly, in the future I hope to apply the ideas presented in this dissertation to older adults who have cognitive impairments such as Alzheimer’s or dementia. I am interested in whether individuals with these kinds of impairments might be able to leverage affect-based resources for
their benefit as well. I am particularly interested in these types of individuals because of the possibility that affect-based resources might compensate for loss of cognitive resources in motivating engagement of both of these resources in their involvement with health-related decision-making and treatment compliance.

In sum, the manuscripts suggest that positive self-perceptions and general emotional health are factors that may contribute to older adults’ adaptive functioning. In the future I plan to explore the building of positive experiences and emotions among individuals of varying cognitive abilities in the domain of health as factors that may increase self-efficacy beliefs, promote motivation to take action, and hopefully in the long-run contribute to maintained functioning throughout older adulthood.
References


