Health Psychology
2003, Vol. 22, No. 1, 3–11

0278-6133/03/$12.00 DOI: 10.1037/0278-6133.22.1.3

Individual Differences in Self-Assessed Health: An Information-Processing Investigation of Health and Illness Cognition

Paula G. Williams
Washington State University

Michelle S. Wasserman
Loyola University of Chicago

Andrew J. Lotto
Washington State University

In 2 studies, the relation between measures of self-assessed health (SAH) and automatic processing of health-relevant information was investigated. In Study 1, 84 male and 86 female undergraduate students completed a modified Stroop task. Results indicated that participants with poorer SAH showed enhanced interference effects for illness versus non-illness words. In Study 2, 27 male and 30 female undergraduate students completed a self-referent encoding task. Results offered a conceptual replication and extension of Study 1 by confirming the specificity of the relation between SAH measures and automatic processing of health (vs. negative or positive general trait) information. These studies provide evidence that individual differences in SAH are reflected in schematic processing of health-relevant information.

Key words: self-assessed health, physical symptoms, health cognition, Stroop

The manner in which individuals assess their health influences both mental and physical health outcomes. For example, perception and reporting of health status are central to health self-regulatory behavior (e.g., deciding when to take medication, when to seek health care, when to stay home from work or school). Moreover, self-assessed health (SAH) is the primary means by which people communicate with health care providers which, in turn, affects the care they receive (e.g., Ellington & Wiebe, 1999). Notably, SAH, particularly global health ratings (i.e., "poor" to "excellent"), significantly predicts mortality above and beyond objective indicators of health (Idler & Benyamini, 1997). Additionally, in some instances, SAH and patterns of health care use become pathological (e.g., hypochondriasis, somatization). Finally, poor SAH appears to be an antecedent risk factor for depressive symptoms and clinical depression (Lewinsohn, Seeley, Hibbard, Rohde, & Sack, 1996; P. G. Williams, Colder, Richards, & Scalzo, 2002). Thus, understanding factors that influence self-assessed health is an important research agenda in health psychology.

From a cognitive–perceptual standpoint, input people receive about their physical health status, whether from internal (e.g., body sensations) or external (e.g., health care professionals) sources, must be processed and organized, just like any other type of information encountered. Presumably, the manner in which people organize health information cognitively will, in turn, affect how they perceive and report on their health. An information-processing approach holds promise as a framework for understanding the perception and encoding of information about physical symptoms and the subsequent recall (report) and evaluation of this information.

A variety of models have been put forth to account for variations in symptom perception, reporting, and health behavior (e.g., Cioffi, 1991; Leventhal, Meyer, & Nerenz, 1980; Pennebaker, 1982). These models share in common a focus on the cognitive processes that underlie symptom perception and reporting. In particular, it is hypothesized that stable mental representations (schemata, scripts) result from experience with symptoms and illnesses and subsequently guide symptom perception, interpretation, and reporting as well as self-regulatory action in response to perceived bodily changes. Prior illness cognition research has focused primarily on "higher order" cognitive concepts such as illness identity, causation, time line, and consequences (for relevant reviews, see Croyle & Barger, 1993; Leventhal, Leventhal, & Cameron, 2001). The predominant method of measuring illness cognition has been to use statistical analyses, such as multidimensional scaling, to examine how responses to paper-and-pencil measures or interviews are organized. Findings from such research have led to the con-

Paula G. Williams and Andrew J. Lotto, Department of Psychology, Washington State University; Michelle S. Wasserman, Department of Psychology, Loyola University of Chicago.

Portions of these data were presented at the 58th Annual Meeting of the American Psychosomatic Society, Savannah, Georgia, March 2000, and as part of a symposium, Health and Illness Cognition: Assessment Methodologies and Applications, at the 23rd Annual Meeting of the Society of Behavioral Medicine, Washington, DC, March 2002. Thanks to Greg Bailey, Jessica Janega, and Irena Persky for assistance with running participants.

Correspondence concerning this article should be addressed to Paula G. Williams, Department of Psychology, Washington State University, P.O. Box 644820, Pullman, Washington 99164-4820. E-mail: pwillms@wsu.edu

struction of questionnaires designed to assess illness cognition (e.g., Weinman, Petrie, Moss-Morris, & Horne, 1996).

Although cognitive models have frequently been invoked to explain individual differences in self-reports of health and illness, little research using experimental information-processing paradigms to directly examine health information processing has been conducted. Unfortunately, the use of self-report questionnaires for assessing cognitive structure (i.e., schemata) is limited in that self-reports may stem from variations in negative verbalizations or reflect self-presentation style (e.g., social desirability, self-handicapping) rather than underlying cognitive structure. Moreover, self-report measures of cognition likely derive from conscious, controlled processes, whereas the construct of interest (in this case, SAH) may derive more strongly from automatic cognitive processes. Indeed, in their recent overview of illness self-regulation, Leventhal et al. (2001) noted that much of the process of constructing illness representations, particularly the mapping of somatic sensations to symptom labels, takes place outside of conscious awareness.

It is important to examine information processing in relation to self-assessed health for several reasons. First, demonstrating reliable relations between self-report measures and performance in information-processing paradigms would provide general support for previous models of individual differences in SAH that emphasize the role of mental representations of health information in the perception and reporting of symptoms and other judgments of health. Second, examination of information-processing aspects of self-assessed health would lead to better understanding of the accuracy of self-reports of illness. Specifically, memory for health-related information (i.e., recall, recognition) can be examined in relation to self-assessed health. Of particular interest is whether or not individuals with poorer self-assessed health exhibit biases in the processing of illness-related information. Finally, understanding the cognitive processes underlying normal variation in symptom reports is relevant to the construction of models of abnormal symptom reporting (e.g., hypochondriasis, somatization), which will inform cognitive assessment and treatment of somatoform spectrum disorders.

The purpose of the current research was to examine the relation between self-assessed health (e.g., symptom reports, global health ratings) and the processing of health-related information in two different experimental information-processing paradigms. Of particular interest is whether individual differences in SAH are related to differential attention allocation to health-relevant information. Thus, the current research focused on automatic, as opposed to conscious, processing. *Conscious processing* refers to mental acts for which people have awareness and that are intentional, effortful, and controllable. *Automatic processing*, on the other hand, subsumes any processing that is nonconscious and is often divided into two types: goal dependent (i.e., intentional, but effortless) and preconscious (i.e., without intention, outside of awareness; Bargh & Chartrand, 2000). Relevant to the current research, a growing body of evidence indicates that the majority of self-regulatory activities operate outside of conscious awareness (Bargh & Chartrand, 1999). In particular, mental representations of self-regulatory goals that underlie decision making are likely nonconscious. Thus, the use of automatic processing paradigms to study health and illness cognition appears warranted.

An Information-Processing Approach to Measuring Health and Illness Cognition

Individual differences in preferential attention allocation to particular content domains (i.e., schematic processing) can be examined in a variety of ways. One approach examines *interference*, or disruption of performance because of selective attention to information within a particular domain. For example, interference in the color naming of words from a particular category in a modified Stroop task suggests preferential attention to information within the category (e.g., J. M. G. Williams, Mathews, & MacLeod, 1996). Another approach examines *facilitation* of a task because of preferential attention to information relevant to the category of interest. Examples include auditory and visual thresholds for schema-related stimuli and reaction time to making self-relevancy judgments (i.e., “me” vs. “not me”) for descriptors. In general support of this approach within the SAH domain, Skelton and Strohmetz (1990) found that individuals with higher physical symptom reports were faster in making judgments of the “health relevance” of a series of word pairs. Skelton and Strohmetz suggested that their findings may reflect schematic processing among high-symptom reporters. Although experimental paradigms of this sort have not been widely applied to examine health and illness cognition, they have been successfully applied to examine cognitive processes underlying psychopathology. For example, Stroop paradigms have been used to examine cognitive structure in depression and anxiety disorders (J. M. G. Williams et al., 1996), and self-relevancy judgments have been applied in the study of cognitive vulnerability to depression (Alloy, Abramson, Murray, Whitehouse, & Hogen, 1997).

The Current Research

In two studies, the relation between self-assessed health and the processing of health and illness information was examined. Study 1 used a modified Stroop paradigm. Interference effects for color naming of illness and non-illness words were examined under situationally activated and nonactivated circumstances. Interference effects in color naming are thought to occur when words semantically match either a temporarily or chronically primed concept (in this case, illness). Examination of information processing in individuals asked to write about a recent illness episode compared with those who did not complete such a task allowed for disentangling the effects of situational activation of concepts versus chronic accessibility of health concepts (for more extensive discussion of priming and automaticity methodologies, see Bargh & Chartrand, 2000). In Study 2, self-relevancy judgments (i.e., “me” vs. “not me”) of health-related and non–health-related adjectives were examined. The primary dependent measure in both studies was reaction time. However, other potential information-processing biases were also examined with measures of response errors, response frequencies, incidental free recall, and recognition accuracy.

Prior research has suggested several hypotheses. To the extent that stable mental representations underlie symptom perception and reporting, individuals with poorer SAH (i.e., more recent symptom reports, more concurrent symptoms, poorer global health ratings) are predicted to demonstrate higher levels of automatic processing of health versus nonhealth information as evidenced by reaction times (greater latency in the Stroop paradigm in Study 1, faster reaction time for judgments of health descriptors in Study 2). Poorer SAH may also be related to preferential recall of health versus nonhealth information. Situational activation by having participants write about a recent illness experience (Study 1) is expected to amplify the effects of information type (illness vs. non-illness) on outcome variables. It is unclear whether or not individual differences in SAH moderate the effects of situational activation on automatic processing, but interaction effects were tested. Finally, the question of whether individuals with poorer SAH are negatively biased in processing health-relevant information was examined. Some prior health cognition research suggests that higher symptom reports may reflect better accuracy (with respect to previously experienced physical symptoms; Skelton & Strohmetz, 1990). The current research examined information-processing accuracy in the context of the experimental task using a recognition-accuracy task.

Study 1

Method

Participants

Participants were 84 male and 86 female undergraduate students who received credit for their participation. Mean age was 19.0 years ($SD = 1.3$). The ethnicity of the sample was as follows: 67.1% Caucasian, 9.4% Hispanic, 8.2% Asian–Indian, 7.6% Asian–Pacific Islander, 2.9% African American, and 4.7% other.

Materials and Equipment

The Stroop paradigm was computer generated using MEL (Version 2.0; Schneider, 1988) and presented on a color monitor. Twenty-eight illness words and 28 non-illness words (see Appendix A) were each presented once in one of four randomly assigned colors: yellow, red, blue, green. Words were matched for length and frequency of use as indicated in Francis and Kucera (1982). Three *primacy* words (i.e., the first words presented) and three *recency* words (i.e., the final words presented) were excluded from analyses. Each word was presented in the center of the screen for 1,500 ms. The presentation of each word was preceded by a fixation cross presented for 1,000 ms. A 2,500-ms pause occurred between the end of the word presentation and the beginning of the next fixation cross. Latency in color naming was recorded via a microphone connected to a voice-activated switch. Latency of response for each word was recorded up until the presentation of the fixation cross preceding the next word (maximum latency of 2,500 ms).

Procedure

After completing informed consent, participants were run individually in a small room containing the equipment described above. Prior to beginning the Stroop task, 91 participants first completed a situational *schema-activation* task that involved writing a narrative about their most recent illness episode.[1] Next, participants completed the modified Stroop task. All instructions for the task were computer generated, although an experimenter was present to answer questions and to record errors in color naming. Following the modified Stroop task, participants were given a sheet of paper and asked to write down as many of the words that had been presented, in any order, that they could recall in a 3-min period. Participants were not informed that they would be completing this task prior to the modified Stroop task. Participants were then left alone in the room to complete the other study measures, also presented via computer.

Self-Assessed Health Measures

Physical symptom report (modified from Larsen & Kasimatis, 1991). A 14-item checklist assessed commonly occurring physical symptoms (e.g., headache, nausea–upset stomach). In the interest of obtaining symptom reports that were relatively free from psychological distress, the depression items from the original Larsen and Kasimatis (1991) scale were not included. Participants rated the same symptoms for both current experience (i.e., "right now") and recent experience (i.e., "past two months") on 5-point scale from *not at all* to *very much*.

Global health rating (Lorig et al., 1996). Participants were asked "In general, how would you rate your physical health," and responded on a 5-point scale from 1 (*poor*) to 5 (*excellent*) with a higher score indicating better perceived overall health. In a sample of 1,129 people, Lorig et al. (1996) found that the mean rating of this item was 3.29 ($SD = 0.91$). In a subset of their sample ($n = 51$), this item displayed a test–retest reliability of .92 over a 10-day interval.

Results

Descriptive Statistics

With respect to global health ratings, 1% of the participants rated their health as "poor," 12% "fair," 42% "good," 31% "very good," and 14% "excellent," with an overall mean of 3.4 ($SD = 0.92$). Item means for current symptoms and recent symptoms (i.e., past 2 months) were 1.5 and 2.1 (SDs $= 0.51$ and 0.66, respectively).

Repeated-Measures Analyses

For each outcome variable, initial repeated-measures analyses of variance (ANOVAs) were computed with word type (illness vs. non-illness) as the repeated factor. Next, Word Type × SAH Variable, Word Type × Group (schema activation vs. no activation), and Word Type × Group × SAH Variable interactions were tested for each SAH variable. Results of these analyses are presented in Table 1.

Response latency. As shown in Table 1, repeated-measures ANOVAs with response latency as the dependent variable indicated a significant word-type effect such that the reaction time for color naming was greater for illness versus non-illness words. This word-type effect was moderated by recent physical symptoms and global health ratings. Individuals who reported experiencing more symptoms in the past 2 months and those who rated their overall health more poorly exhibited longer color-naming latencies for illness versus control words. Post hoc analyses of these interactions indicated that the word-type effect was significant for both

[1] The illness narrative and control conditions were run as consecutive experiments that were identical except for the narrative writing component. The samples were combined to allow for examination of schema-activation effects.

Table 1
Repeated-Measures Analysis of Variance for Study 1

Source	*df*	*F*	η^2
Response latency			
Word Type (illness vs. non-illness)[a]	1, 169	63.2****	.27
Word Type × Rec Symp	1, 168	6.1***	.04
Word Type × Global Health	1, 168	5.0**	.03
Word Type × Cur Symp	1, 168	2.2	
Word Type × Group	1, 168	0.3	
Word Type × Rec Symp × Group	1, 166	0.0	
Word Type × Global Health × Group	1, 166	0.0	
Word Type × Cur Symp × Group	1, 166	0.0	
Color-naming Errors			
Word Type (illness vs. non-illness)[b]	1, 169	9.4***	.05
Word Type × Rec Symp	1, 168	0.4	
Word Type × Global Health	1, 168	0.3	
Word Type × Cur Symp	1, 168	1.0	
Word Type × Group	1, 168	0.1	
Word Type × Rec Symp × Group	1, 166	0.2	
Word Type × Global Health × Group	1, 166	2.3	
Word Type × Cur Symp × Group	1, 166	0.2	
Incidental free recall			
Word Type (illness vs. non-illness)[c]	1, 169	210.8****	.56
Word Type × Rec Symp	1, 168	1.2	
Word Type × Global Health	1, 168	0.0	
Word Type × Cur Symp	1, 168	0.1	
Word Type × Group	1, 168	3.3*	.02
Word Type × Rec Symp × Group	1, 166	2.6	
Word Type × Global Health × Group	1, 166	2.0	
Word Type × Cur Symp × Group	1, 166	0.0	

Note. Rec = recent; Symp = symptoms; Group = schema activation (illness narrative) versus no activation; Cur = current.
[a] *M*s = 686.8 ms versus 662.3 ms; *SD*s = 18.7 versus 19.4. [b] *M*s = 0.3 ms versus 0.1 ms; *SD*s = 0.55 versus 0.38. [c] *M*s = 4.0 ms versus 1.3 ms; *SD*s = 2.2 versus 1.0.
* $p = .07$. ** $p < .05$. *** $p < .01$. ****$p < .0001$.

high and low SAH (by median split; *F*s > 11.90, *p*s < .001). However, high symptom reporters (*M*s = 693 vs. 665), and participants with poorer global health ratings (*M*s = 702 vs. 671), displayed a greater interference for illness versus control words compared with low symptom reporters (*M*s = 679 vs. 658) and participants with better global health ratings (*M*s = 667 vs. 651). Neither the Word Type × Group (schema activation vs. no activation) interaction nor any of the three-way interactions with the SAH variables were significant. Thus, writing a narrative about a recent illness experience did not differentially affect response latency for color-naming illness words versus non-illness words.

Color-naming errors. Although very few errors were recorded overall, there was a significant word-type effect on errors, such that more errors were made naming the color of illness versus control words (Table 1). The SAH variables (i.e., current and recent symptoms and global health ratings) did not moderate the word-type effect on errors, nor did writing about a recent illness experience.

Incidental free recall. On average, participants recalled significantly more illness than non-illness words in the recall task (Table 1). None of the SAH variables moderated this effect, and neither the Word Type × Group (schema activation vs. no activation) interaction nor any of the three-way interactions with the SAH variables were significant.

Study 1 Discussion

Results of Study 1 suggest that, on average, individuals preferentially attend to illness information compared with other words matched for length and frequency of use. This differential effect of illness versus control words was seen across outcome variables (i.e., color-naming latency, color-naming errors, and incidental free recall). The effect on color-naming latency was moderated by SAH: Individuals with poorer ratings of health and those who reported more recent symptoms displayed enhanced word-type effects. The findings provide evidence that ratings of poor health and physical symptom reports are reliably associated with enhanced automatic processing of physical illness information. The schema activation manipulation (i.e., writing about a recent illness experience) did not moderate the word-type effects for any of the outcome variables. Moreover, the effects of this manipulation did not vary by level of SAH.

This study is limited, however, by using a noncategory comparison group. Arguably, some of the effects seen were due to the health words constituting a detectable category, whereas the control words were not conceptually interrelated. This would, in part, account for the rather large word-type effects across outcome variables. Although this does not negate the moderating effect of SAH on automatic processing, results of this study cannot address the specificity of this effect. That is, are these effects specific to health information (vs., e.g., general negative self-relevant information)? This question was addressed in Study 2.

Study 2

Study 2 offered a conceptual replication of Study 1 by using an alternate information-processing paradigm—a self-referent encoding task. Automatic processing within this paradigm would be demonstrated by faster reaction times (i.e., facilitation) for making self-relevancy judgments for schema-congruent material. Additionally, Study 2 included other comparison categories of self-relevant information: general positive and negative trait information. In this way, the specificity of the effects of SAH on health- (vs. a similarly valenced general trait) information processing could be examined.

Method

Participants

Participants were 27 male and 30 female undergraduate students who received credit for their participation. Mean age was 19.2 years (*SD* = 2.2). Ethnic distribution was 68.4% Caucasian, 8.8% Hispanic, 8.8% Asian/Pacific Islander, 5.3% African American, 3.5% Asian/Indian, and 5.3% other.

Materials and Equipment

The self-relevancy task was computer generated using MEL (Version 2.0) and presented on a color monitor. A total of 116 adjectives were presented individually in the center of the screen. Each word was preceded by a fixation cross that was presented for 1 s, followed by a 250-ms pause. Words were each presented for 4 s, regardless of response time. Participants responded to each adjective presented by pressing keyboard keys marked “me” and “not me” (covering the “z” and “/” keys, which were alternated in their designation to counterbalance for hand dominance). Twenty-six negative health-relevant adjectives and three positive-health adjectives were among the presented words.[2] For the purposes of the present study, 24 negative general-trait adjectives and 24 positive general-trait adjectives were the comparison words (see Appendix B for the full list). The order in which the adjectives were presented was randomly generated for each participant.

Procedure

As in Study 1, participants completed a single, individual laboratory session. Following informed consent, participants completed the self-relevancy task alone in a small testing room. Following the task, participants completed the incidental free-recall task described in Study 1 and a computer-generated recognition-accuracy task. A selection of words, some of which had and some of which had not been previously presented, were shown one at a time on the screen. For each word, participants indicated whether or not they had seen the word in the self-relevancy task. Participants then completed the same computer-generated health questionnaires as in Study 1.

Results

Repeated-Measures Analyses

Descriptive analyses for relevant study variables are presented in Table 2. To examine the specificity of the relations between SAH and the information-processing outcome measures, and to control for overall response patterns to negative self-relevant information, repeated-measures ANOVAs were performed with word type (health vs. general-trait adjectives) as the repeated factor. The health and general-trait adjectives were matched in valence in all analyses (i.e., positive health vs. positive general adjectives, negative health vs. negative general adjectives). In this way, the specificity of effects could be examined beyond valence (e.g., negativity). Word-type effects were initially examined in repeated-measures ANOVAs for each of the outcome categories. Moderation of the word-type effects (i.e., Word Type × SAH interaction in repeated-measures ANOVAs) was then examined for each continuous SAH variable (current symptoms, recent symptoms, general health ratings). Results of these analyses are presented in Table 3.

Reaction time for self-relevancy judgments. There was no overall word-type effect for reaction time for making self-relevancy judgments (i.e., “me” vs. “not me”) for negative health versus negative general trait adjectives (see Table 3). However, there was a significant Recent Symptom × Word Type interaction. Post hoc analyses indicated a crossover interaction in which the word-type effect was stronger (though not significant) for high symptom reporters (by median split), $F(1, 26) = 2.01$, $p = .17$, compared with low symptom reporters, $F(1, 29) = 0.95$, $p = .34$, for whom the means were in the opposite direction (see Figure 1). Individuals who reported more recent physical symptoms were faster in responding to negative health adjectives compared with general negative trait adjectives, whereas the opposite was true for participants reporting fewer recent symptoms. None of the other SAH variables moderated the word-type effect for negative health versus negative trait descriptors.

For positive health versus positive general trait adjectives, there was a significant word-type effect. On average, participants were faster in making self-relevancy judgments for general positive trait adjectives. There was a significant General Health Rating × Word Type interaction. Post hoc analyses indicated a significant word-type effect for participants with poorer global health ratings (by median split), $F(1, 30) = 8.64$, $p < .01$, but not for those with better global health ratings, $F(1, 25) = 0.10$, $p = .75$. Individuals who rated their health as “poor,” “fair,” or “good” (i.e., below or equal to the median) were faster in making judgments about positive general versus positive health adjectives, whereas those who rated their overall health more favorably (i.e., “very good,” “excellent”) were equally fast in making judgments of both types of words. Notably, individuals with better global health ratings were faster across categories, $F(1, 55) = 8.11$, $p < .01$. Means of high and low global health rating groups are plotted in Figure 2.

Frequency of “me” responses. Although not an indicator of automatic processing per se, the frequency of “me” responses was examined to clarify the effects seen with response times for making these judgments. On average, participants endorsed a higher percentage of negative general trait adjectives versus negative health-related adjectives (Table 3). None of the SAH variables moderated the word-type effect.

Participants also endorsed a higher percentage of positive general-trait adjectives versus positive health-related adjectives (Table 3). This word-type effect was moderated by global health ratings and current symptom reports. Individuals with poorer overall health ratings (by median split; i.e., “poor,” “fair,” or “good”) endorsed a smaller percentage of positive health versus positive general descriptors, $F(1, 30) = 13.5$, $p < .0001$ (Ms = 0.66

Table 2
Means and Standard Deviations for Study 2 Variables

Variable	*M*	*SD*
Current symptoms	1.41	.39
Recent symptoms	1.71	.44
Global health	3.42	.96
Reaction time—negative health words	1,340.69	316.02
Reaction time—negative trait words	1,330.08	296.51
Reaction time—positive health words	1,315.93	460.03
Reaction time—positive trait words	1,221.96	296.17
Recall—negative health words (%)	.14	.08
Recall—negative trait words (%)	.15	.07
Recall—positive health words (%)	.04	.03
Recall—positive trait words (%)	.21	.07
Recognition accuracy—negative health words	.77	.22
Recognition accuracy—negative trait words	.88	.14
Recognition accuracy—positive health words	.87	.12
Recognition accuracy—positive trait words	.85	.17

Note. Means for symptoms are item means.

[2] It is noteworthy that there are very few descriptors in our lexicon that fit the category “positive health.” This is consistent with the notion that the prevailing view of health is “absence of illness.”

Table 3
Repeated-Measures Analysis of Variance for Study 2

Source	*df*	*F*	η^2
Response latency—negative adjectives			
Word Type (health vs. general trait)[a]	1, 56	0.18	
Word Type × Rec Symp	1, 55	3.7**	.06
Word Type × General Health Rating	1, 55	0.1	
Word Type × Cur Symp	1, 55	0.2	
Response latency—positive adjectives			
Word Type (health vs. general trait)[b]	1, 56	4.7**	.08
Word Type × Rec Symp	1, 55	1.2	
Word Type × General Health Rating	1, 55	5.2**	.09
Word Type × Cur Symp	1, 55	1.5	
Response frequency (%)—negative adjectives			
Word Type (health vs. general trait)[c]	1, 56	43.2****	.44
Word Type × Rec Symp	1, 55	0.1	
Word Type × General Health Rating	1, 55	0.2	
Word Type × Cur Symp	1, 55	0.1	
Response frequency (%)—positive adjectives			
Word Type (health vs. general trait)[d]	1, 56	8.5***	.13
Word Type × Rec Symp	1, 55	1.4	
Word Type × Global Health Rating	1, 55	9.8***	.15
Word Type × Cur Symp	1, 55	5.8**	.10
Recognition accuracy—negative adjectives (% correct)			
Word Type (health vs. general trait)[e]	1, 56	18.9****	.25
Word Type × Rec Symp	1, 55	5.5**	.09
Word Type × Global Health Rating	1, 55	0.0	
Word Type × Cur Symp	1, 55	1.8	

Note. Rec = recent; Symp = symptoms; Cur = current.
[a] *M*s = 1,339.7 ms versus 1,330.1 ms; *SD*s = 316.0 versus 296.5. [b] *M*s = 1,314.9 ms versus 1,220.9 ms; *SD*s = 460.0 versus 296.0. [c] *M*s = 0.1 ms versus 0.2 ms; *SD*s = 0.14 versus 0.09. [d] *M*s = 0.8 ms versus 0.9 ms; *SD*s = 0.1 versus 0.3. [e] *M*s = 0.8 ms versus 0.9 ms; *SD*s = 0.2 versus 0.1.
** $p < .05$. *** $p < .01$. **** $p < .0001$.

vs. 0.84), whereas individuals who reported their health to be "very good" or "excellent" endorsed an equal percentage of both positive health and positive general descriptors, $F(1, 25) = 0.01$, $p = .93$ (*M*s = 0.92). Similarly, individuals reporting more symptoms at the time of assessment (median split) endorsed a smaller percentage of positive health versus positive general descriptors, $F(1, 25) = 8.8$, $p < .01$ (*M*s = 0.69 vs. 0.85), whereas those with fewer current symptoms did not show such an effect, $F(1, 30) = 1.34$, $p = .26$ (*M*s = 0.85 vs. 0.90). Although using percentages controls for the differences in the number of words in each category, these findings regarding positive health versus positive general adjectives should be interpreted cautiously given the small number of positive health descriptors.

Incidental free recall. Incidental free recall was quantified by calculating the percentage of the total number of words recalled (within participant), for each word type. Repeated-measures ANOVAs with negative health descriptors versus negative general-trait adjectives as the repeated factor revealed a nonsignificant word-type effect. Overall, participants were no more likely to recall negative health adjectives ($M = 0.14$, $SD = 0.08$) compared with negative general-trait adjectives ($M = 0.15$, $SD = 0.07$). None of the SAH variables moderated the word-type effect. Incidental free recall was not examined for positive health versus positive general descriptors given the small number of positive health descriptors.

Recognition accuracy. For each word category, three of the words that appeared in the self-relevancy task and three "false" words (e.g., negative health adjectives that had not been previously presented) were shown in the recognition task. Thus, for each word category, the number of "hits" (i.e., words correctly identified as having been previously presented) and "correct rejections" (i.e., words correctly identified as having not been previously presented) can be calculated to arrive at an overall accuracy score (i.e., hits + correct rejections ÷ the total possible for that category). Repeated-measures ANOVAs indicated an overall word-type effect (Table 3). Participants were more accurate in recognizing negative general-trait adjectives that had been previously presented compared with negative health adjectives. This word-type effect was moderated by recent symptoms. Individuals with lower symptom reports showed a stronger word-type effect, $F(1, 26) = 12.93$, $p < .01$ (*M*s = 0.86 vs. 0.72) compared with those with higher symptom reports, $F(1, 29) = 6.43$, $p < .05$ (*M*s = 0.90 vs. 0.82). Thus, individuals with higher recent symptom reports displayed accuracy for negative health adjective recognition that was closer to that for general negative-trait adjectives. No other SAH variable interacted with word type in repeated-measures analyses of recognition accuracy.

Study 2 Discussion

Study 2 demonstrated a reliable relation between SAH and a measure of automatic processing of health-related information, offering a conceptual replication of Study 1. Additionally, the findings of Study 1 were extended by confirming the specificity of

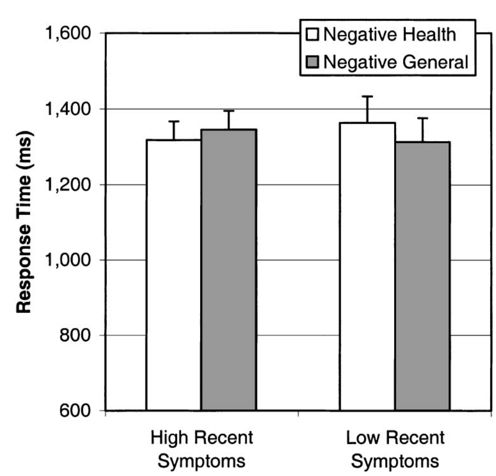

Figure 1. Mean reaction times and standard errors for self-relevancy judgments of negative health descriptors versus negative general descriptors for high and low reporters of recent symptoms.

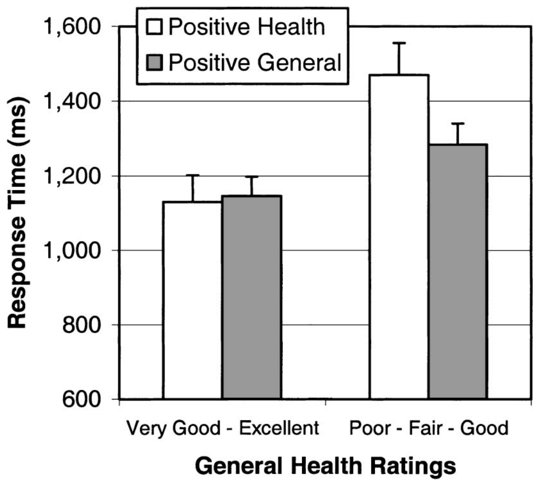

Figure 2. Mean reaction times and standard errors for self-relevancy judgments of positive health descriptors versus positive general descriptors by global health rating.

automatic processing to health-relevant information in comparison with general negative-trait information. In particular, individuals with higher recent symptom reports showed lower reaction time to making self-relevancy judgments of negative health descriptors versus negative general-trait adjectives. Thus, Study 2 demonstrated enhanced automatic processing specific to health information in relation to SAH variables via facilitation effects.

General Discussion

One of the most central aspects of health self-regulatory behavior is the process by which individuals evaluate their health. A presumption of models of illness cognition and symptom perception is that there are stable mental representations of health-relevant information that influence the processing and reporting of health and physical symptoms. To our knowledge, the current research represents the first attempt to directly examine the relations between schematic processing of health information and self-assessments of health using experimental information-processing paradigms.

Two studies, using different experimental paradigms, revealed reliable relations between measures of self-assessed health and automatic processing of health-relevant information. In Study 1, individuals with poorer SAH, as measured by recent symptom reports and general health ratings, displayed enhanced interference (i.e., longer response times) in color naming of illness versus non-illness words in a modified Stroop task. Results of Study 2 provided a conceptual replication of these effects using a self-referent encoding task (i.e., "me" vs. "not me" judgments) and demonstrated that these effects are specific to self-relevant health information versus general self-relevant information. Although both recent symptom reports and global health ratings were similarly related to automatic processing of symptom words versus neutral words in Study 1, Study 2 demonstrated some information-processing differences between these two SAH variables when valence of information was considered. Recent symptom reports were related to enhanced automatic processing of negative health-relevant descriptors versus negative general-trait descriptors, whereas global health ratings moderated the word-type effect for positive health descriptors versus positive general-trait descriptors. Although further research is necessary to clarify the nature of the cognitive processes that underlie these two SAH measures, one possibility is that global health ratings are more strongly related to an overall sense of well-being. That is, positive perceived global health may be reflected in schematic processing of positive self-relevant information, without specificity to health per se; low ratings of global health, on the other hand, may be reflected in a lack of schematic processing for positive health descriptors in particular (see Figure 2).

It should be noted that current symptom reports (i.e., symptoms experienced during the experimental session) were not related to information-processing outcomes in either study. This may be due, in part, to participants experiencing very few concurrent symptoms. Although the results of the current research suggest that schematic processing of health-relevant information is more strongly related to symptom recall and global health judgments, future research should examine these effects in participants who are experiencing a higher degree of physical symptoms (e.g., are acutely ill).

Additionally, in Study 1 the effects of situational (vs. chronic) activation of health information were examined by having some participants write about a recent illness experience prior to completion of the modified Stroop task. Results indicated that this situational activation did not affect color-naming latency of illness versus non-illness words. Moreover, individuals with poorer self-assessed health were not differentially affected by this manipulation. These findings suggest that there are stable individual differences in automatic processing of health-related information that are not strongly influenced by situational factors (i.e., health information is chronically accessible). Although it is certainly possible that a "stronger" manipulation (e.g., watching a graphic medical video) might alter health information processing, the current paradigm was designed to simulate a naturalistic, personal event (e.g., describing an illness to a health care provider).

In addition to recall processes, Study 2 examined recognition accuracy. The findings indicate that individuals with higher recent symptom reports were more accurate in determining which negative health adjectives had and had not been previously presented. Although generalization to other contexts should be made cautiously, these results suggest that individuals with higher symptom reports may not be biased toward overreporting of past symptom experiences. Rather, individuals with lower symptom reports may, in fact, be underreporting past symptom experiences—a hypothesis that must be tested directly.

It is noteworthy that overall, stronger relations were found between the SAH variables and the reaction time (Studies 1 and 2) and recognition (Study 2) outcome variables than for the free-recall task. In considering the nature of the free-recall task, it is clear that this is a weaker test of automatic processing compared with either response latencies or forced-recognition tasks. Specifically, there is likely a conscious processing component to completing the free-recall task such that participants may choose not to write down a word if they are unsure about its previous presentation. Thus, individual differences in self-presentational style (e.g., social desirability) may influence the outcome of this task.

Study Limitations and Future Directions

The purpose of the current study was to establish links between information processing and self-assessed health across the normal range of health experiences and used a sample of predominantly healthy older adolescents–young adults. This age group provides an opportune developmental time point at which to examine health and illness cognition, because this is the age at which a person's health self-regulatory behavior is usually first becoming independent from parents (P. G. Williams, Holmbeck, & Greenley, 2002). Thus, current findings reflect health information processing prior to the participants having extensive experience with chronic illness or the health care industry. However, generalization to other populations should be made cautiously. Examination of health information processing must be extended to other populations (e.g., acutely and chronically ill) and age groups (e.g., older adults) in future research. The current study is also limited by the concurrent nature of data collection. Longitudinal examination of health information processing in relation to changing physical status is an important target for future research. For example, how does experience with both acute and chronic illness alter health-related cognition, and what are the implications for health self-regulatory behavior?

In future research, laboratory information-processing paradigms could be extended to examine individuals with abnormal symptom-reporting tendencies (e.g., hypochondriasis, somatization) in comparison with individuals within the "normal" range. The findings of the current study suggest that there is significant variability in the level of automatic processing related to health concepts. A question for future inquiry is how much allocation of attention to health information is optimal. One could hypothesize that deviations from an optimal level in either direction could be detrimental. For example, individuals for whom health-relevant material is not readily accessible (i.e., they "underattend" to their health) may be less likely to engage in protective health behavior, may underreport health concerns to health care professionals, or may not seek medical services when appropriate. On the other end of the continuum, some individuals may overattend to health-relevant information, which could potentially lead to inappropriate use of health services, increased functional disability (i.e., sick role behavior), and subsequent psychological distress. The factors that influence where individuals fall along this hypothesized curvilinear function await empirical determination. Some viable possibilities include personality–dispositional tendencies, social learning histories (including parental response to childhood illness), and, of course, direct experience with illnesses and injuries.

As the field of cognitive health psychology develops, a range of experimental paradigms can be used to extend knowledge not just of the content but also of the structure of illness cognition. For example, the link between state mood and symptom reports has been repeatedly demonstrated (Croyle & Uretsky, 1987; Salovey & Birnbaum, 1989; P. G. Williams, Colder, Lane, et al., 2002; P. G. Williams & Wiebe, 2000). Links between emotion and health information in cognitive "space" can be examined using automatic processing methodologies. Additionally, important moderators of symptom reporting such as neuroticism–trait negative affectivity and gender can be examined using health information-processing paradigms.

Over time, health psychology researchers have both inappropriately embraced and summarily rejected self-reports of health and illness. As much previous research on symptom perception and reporting has demonstrated, a host of both situational and dispositional factors, in addition to bodily changes, influence symptom reports. Indeed, there has been a renewed interest in the science of self-reports generally and of self-reports of health-relevant information specifically (Stone et al., 2000). A movement within health psychology toward the use of experimental information-processing paradigms offers the ability to examine empirically the cognitive processes that underlie self-assessments of health, as well as reports–recall of health behavior. Use of these paradigms will help to ensure the viability of the emerging subfield of cognitive health psychology. Rather than dismiss self-assessed health as nonveridical in relation to objective pathology, one focus of health psychology research should be directed toward delineating how objective health changes are represented cognitively, what factors moderate health information processing, and how these cognitive processes, in turn, influence health self-regulatory behavior. Given the growing body of evidence that much of the perceptions, judgments, and decisions of everyday life are guided by automatic cognitive processes (Bargh & Chartrand, 1999), there is every reason to believe the same holds true for health and illness cognition.

References

Alloy, L. B., Abramson, L. Y., Murray, L. A., Whitehouse, W. G., & Hogen, M. E. (1997). Self-referent information-processing in individuals at high and low risk for depression. *Cognition and Emotion, 11,* 539–568.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462–479.

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. T. Reis, & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 253–285). New York: Cambridge University Press.

Cioffi, D. (1991). Beyond attentional strategies: A cognitive–perceptual model of somatic interpretation. *Psychological Bulletin, 109,* 25–41.

Croyle, R. T., & Barger, S. D. (1993). Illness cognition. In S. Maes, H. Leventhal, & M. Johnston (Eds.), *International review of health psychology* (Vol. 2, pp. 29–49). Chichester, England: Wiley.

Croyle, R. T., & Uretsky, M. B. (1987). Effects of mood on self-appraisal of health status. *Health Psychology, 6,* 239–253.

Ellington, L., & Wiebe, D. J. (1999). Neuroticism, symptom presentation, and medical decision making. *Health Psychology, 18,* 634–643.

Francis, W. N., & Kucera, H. (1982). *Frequency analysis of English usage: Lexicon and grammar.* Boston: Houghton Mifflin.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior, 38,* 21–37.

Larsen, R. J., & Kasimatis, M. (1991). Day-to-day physical symptoms: Individual differences in the occurrence, duration, and emotional concomitants of minor daily illnesses. *Journal of Personality, 59,* 387–423.

Leventhal, H., Leventhal, E. A., & Cameron, L. (2001). Representations, procedures, and affect in illness self-regulation: A perceptual–cognitive model. In A. Baum, T. A. Revenson, & J. E. Singer (Eds.), *Handbook of health psychology* (pp. 19–47). Mahwah, NJ: Erlbaum.

Leventhal, H., Meyer, D., & Nerenz, D. (1980). The common sense representation of illness danger. In S. Rachman (Ed.), *Medical psychology* (pp. 7–30). New York: Pergamon.

Lewinsohn, P. M., Seeley, J. R., Hibbard, J., Rohde, P., & Sack, W. H. (1996). Cross-sectional and prospective relationships between physical morbidity and depression in older adolescents. *Journal of the Academy of Child and Adolescent Psychiatry, 35,* 1120–1129.

Lorig, K., Stewart, A., Ritter, P., Gonzalez, V., Laurent, D., & Lynch, J. (1996). *Outcome measures for health education and other health care interventions.* Thousand Oaks, CA: Sage.

Pennebaker, J. W. (1982). *The psychology of physical symptoms.* New York: Springer-Verlag.

Salovey, P., & Birnbaum, D. (1989). Influence of mood on health-relevant cognition. *Journal of Personality and Social Psychology, 57,* 539–551.

Schneider, W. (1988). Micro experimental laboratory: An integrated system for IBM PC compatibles. *Behavioral Research Method, Instruments, and Computers, 20,* 206–217.

Skelton, J. A., & Strohmetz, D. B. (1990). Priming symptom reports with health-related cognitive activity. *Personality and Social Psychology Bulletin, 16,* 449–464.

Stone, A. A., Turkkan, J. S., Bachrach, C. A., Jobe, J. B., Kurtzman, H. S., & Cain, V. S. (Eds.) (2000). *The science of self-report: Implications for research and practice.* Mahwah, NJ: Erlbaum.

Weinman, J., Petrie, K. J., Moss-Morris, R., & Horne, R. (1996). The Illness Perception Questionnaire: A new method for assessing the cognitive representation of illness. *Psychology and Health, 11,* 431–445.

Williams, J. M. G., Mathews, A., & MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological Bulletin, 120,* 3–24.

Williams, P. G., Colder, C. R., Lane, J. D., McCaskill, C. C., Feinglos, M., & Surwit, R. S. (2002). Examination of the neuroticism–symptom reporting relationship in patients with Type-2 diabetes. *Personality and Social Psychology Bulletin, 28,* 1015–1025.

Williams, P. G., Colder, C. R., Richards, M. H., & Scalzo, C. A. (2002). The role of self-assessed health in the relationship between gender and depressive symptoms among adolescents. *Journal of Pediatric Psychology, 27,* 509–517.

Williams, P. G., Holmbeck, G. N., & Greenley, R. N. (2002). Adolescent health psychology. *Journal of Consulting and Clinical Psychology, 70,* 828–842.

Williams, P. G., & Wiebe, D. J. (2000). Individual differences in self-assessed health: Gender, neuroticism, and physical symptom reports. *Personality and Individual Differences, 28,* 823–835.

Appendix A

Words Used in Study 1 Modified Stroop Task

Illness words: ulcer, constipation, infection, stiffness, virus, sneeze, shaky, fever, vertigo, swollen, ache, rash, bleeding, sweaty, pain, itch, cramp, flu, blister, nausea, numb, bruised, dizzy, vomit, headache, cough, diarrhea, sore

Matched non-illness words: silo, fade, housekeeping, delights, tempt, tuba, stirs, listing, stables, par, mushy, seawater, judged, cafe, fanatic, lemon, evolution, tales, baffle, bothered, kinks, levy, miss, scars, altar, pliable, curfew, petitions

Appendix B

Adjectives Used in Study 2 Self-Referent Encoding Task

Negative health descriptors: itchy, nauseated, feverish, numb, shaky, sweaty, constipated, sore, stiff, achy, bruised, dizzy, congested, sickly, ill, unhealthy, feeble, trembling, ailing, diseased, unwell, frail, queasy, flushed, groggy, light-headed

Negative general descriptors: lazy, mean, crude, stupid, dumb, vain, cruel, sloppy, greedy, foolish, vulgar, gloomy, selfish, nervous, boring, jealous, hateful, fearful, stubborn, snobbish, scornful, cowardly, spiteful, grouchy

Positive health descriptors: healthy, energetic, active

Positive general descriptors: wise, happy, brave, loving, loyal, moral, smart, kindly, caring, helpful, heroic, honest, skillful, gentle, polite, reliable, hopeful, creative, generous, talented, tolerant, trusting, truthful, ethical