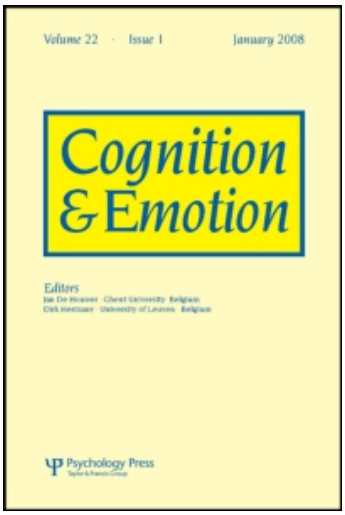

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Self-referent Information-processing in Individuals at High and Low Cognitive Risk for Depression

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Whereas prior work has demonstrated that depressed persons exhibit preferential processing of negative self-referent information, the present study investigated whether persons who are cognitively vulnerable to depression show similar negative self-referent processing. Nondepressed participants in the Temple–Wisconsin Cognitive Vulnerability to Depression Project who were at hypothesised high or low cognitive risk for depression based on their dysfunctional attitudes and inferential styles were administered a Self-referent Information Processing Task Battery that yielded five information-processing measures: judgements of self-descriptiveness ("Me/Not Me") of trait words; response times for these judgements; past behavioural examples for self-descriptive words; future behavioural predictions; and correct recall of the trait words. Each dependent measure yielded scores for four types of stimuli in a Valence × Content design: positive and negative stimuli that

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were either relevant or irrelevant to a depressive self-concept. Consistent with prediction, relative to low cognitive risk participants, high cognitive risk participants exhibited greater processing of negative self-referent information and less processing of positive self-referent information on all measures. Moreover, there was some evidence that risk group differences in self-referent processing biases were greater for depression-relevant than for depression-irrelevant content domains. The findings are discussed with respect to theoretical and methodological implications for the cognitive theories of depression.

INTRODUCTION

Cognitive vulnerability-stress theories of depression, such as Beck's (1967, 1987) cognitive theory and the hopelessness theory of depression (Abramson, Metalsky, & Alloy, 1989; Alloy, Abramson, Metalsky, & Hartlage, 1988), hypothesise that particular negative cognitive patterns increase individuals' likelihood of developing episodes of depression, in particular, episodes of a cognitively mediated subtype of depression (Abramson & Alloy, 1990; Abramson et al., 1989), when they experience stressful life events. According to these cognitive theories, people who possess such maladaptive cognitive patterns are vulnerable to depression because they tend to engage in negatively toned information-processing about themselves and their experiences when they encounter stressful events.

In Beck's theory (1967, 1987; Beck, Rush, Shaw, & Emery, 1979), for example, depression-prone people are hypothesised to possess negative self-schemata revolving around themes of inadequacy, failure, loss, and worthlessness. Such negative content is represented as a set of dysfunctional attitudes or self-worth contingencies in which the depression-prone person subscribes to maladaptive beliefs such as his/her happiness and success depend on being perfect or on others' approval. Consistent with cognitive science and social cognition perspectives on the operation of schemata (e.g. Alba & Hasher, 1983; Brewer & Nakamura, 1984; Taylor & Crocker, 1981), Beck (1967) hypothesised that depressive self-schemata guide the perception, interpretation, and memory of personally relevant experiences, with the result being a negatively biased construal of one's personal world. When activated by the occurrence of stressful life events, depressive self-schemata lead to the development of depressive symptoms through their effect on preferential encoding and retrieval of negative self-referent information.

In the hopelessness theory (Abramson et al., 1989; Alloy et al., 1988), people who exhibit a depressogenic inferential style, in which they characteristically attribute negative life events to stable and global causes, infer that negative consequences will follow from a current negative event, and infer that the occurrence of a negative event in their lives means that they

are fundamentally flawed or worthless, are hypothesised to be vulnerable to developing episodes of depression, in particular "hopelessness depression", when they confront negative life events. This is because individuals who exhibit a depressogenic inferential style should be more likely to generate negative inferences regarding the causes, consequences, and self-implications of stressful events than individuals who do not possess this style, thereby increasing the likelihood that they will develop hopelessness and, in turn, symptoms of hopelessness depression. Similar to Beck's model, then, the hypothesised cognitive vulnerability in the hopelessness theory operates to increase risk for depression through its effects on processing or appraisals of personally relevant life experiences.

Cognitive Vulnerability and Self-referent Information-processing

In studies examining the cross-sectional or longitudinal relation between cognitive vulnerability and depression, investigators have typically used one of two strategies for measuring the cognitive vulnerabilities featured in Beck's theory and hopelessness theory: (1) self-report questionnaires designed to assess the content of self-schemata or cognitive styles; or (2) laboratory tasks adapted from cognitive psychology designed to assess the information-processing biases associated with the operation of self-schemata or cognitive styles.[1] For example, numerous studies have investigated whether dysfunctional beliefs as measured by the Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) or depressogenic attributional styles as measured by the Attributional Style Questionnaire (ASQ; Seligman, Abramson, Semmel, & von Baeyer, 1979) are associated concurrently with depression, remain elevated following remission from depression, or predict future depression alone or in interaction with stressful events (see, for example, Barnett & Gotlib, 1988 for a review). More recently, some researchers have turned to cognitive psychology paradigms modified for use with emotion-relevant stimuli, such as the Self-referent Encoding task (SRET; Craik & Tulving, 1975; Derry & Kuiper, 1981; Markus, 1977) or the Stroop task (Stroop, 1935; Gotlib & McCann, 1984; Segal & Vella, 1990), as an alternative approach for examining cognitive vulnerability in currently depressed, previously depressed, or future depressed individuals.

[1] Although self-report inventories are typically used to measure the content of cognitive vulnerabilities and laboratory tasks are generally used to measure the processing effects of these vulnerabilities, this is not a necessary distinction between the two types of methodologies. For example, some studies have assessed information-processing biases with self-report questionnaires (e.g. Alloy & Ahrens, 1987; Haack, Metalsky, Dykman, & Abramson, 1996).

What is the association between cognitive patterns as assessed by self-reports and information-processing as assessed by laboratory tasks? Specifically, in the present study, we examined whether individuals at hypothesised high and low vulnerability for depression based on the presence versus absence of dysfunctional attitudes and negative inferential styles also differ in their processing of self-referent information. We believe this issue is important for three major reasons.

First, the issue of whether information-processing biases associated with depression are actually reflective of an underlying vulnerability is of central concern to cognitive models of depression. Several theorists (e.g. Beck, 1967, 1987; Ingram & Wisnicki, 1991; Williams, Watts, MacLeod, & Mathews, 1988) have proposed that self-schema guided dysfunctional information-processing plays a causal role in depression. Prior work has demonstrated that depressed persons often show preferential processing of negative self-referent information (e.g. Segal, 1988), including greater endorsement and recall of depressive-content self-referent trait adjectives (e.g. Derry & Kuiper, 1981; Greenberg & Alloy, 1989; Greenberg & Beck, 1989; Ingram, Fidaleo, Freidberg, Shenk, & Bernet, 1995; Ingram, Smith, & Brehm, 1983; Kuiper & MacDonald, 1982), faster decision times for negative self-referent stimuli (e.g. Greenberg & Alloy, 1989; MacDonald & Kuiper, 1984), increased accessibility of negative constructs (e.g. Bargh & Tota, 1988; Dobson & Shaw, 1987; Gotlib & Cane, 1987; Gotlib & McCann, 1984), and preferential attention to negative or emotional stimuli (e.g. Dobson & Shaw, 1987; Gotlib, McLachlan, & Katz, 1988; Ingram, Bernet, & McLaughlin, 1994a; McCabe & Gotlib, 1993). However, these information-processing biases may be the result of the depressed episode rather than an indicator of vulnerability to depression. The finding of negative, self-referent processing biases in nondepressed individuals who are vulnerable to depression by virtue of possessing negative cognitive styles would be consistent with, although not fully indicative of, a vulnerability function for these biases.

Several investigators have attempted to determine whether self-schema processing is indicative of underlying vulnerability to depression by assessing information-processing in persons who have remitted from depression (e.g. Bradley & Mathews, 1988; Dobson & Shaw, 1987; Gotlib & Cane, 1987; Hammen, Marks, de Mayo, & Mayol, 1985; Hammen, Miklowitz, & Dyck, 1986; Hedlund & Rude, 1995; Ingram et al., 1994a; McCabe & Gotlib, 1993; Teasdale & Dent, 1987; Williams & Nulty, 1986). However, approaches to identifying self-referent processing biases associated with vulnerability to depression based on remitted depression paradigms are problematic in at least one respect (see Just, Abramson, & Alloy, submitted, for other problems with remitted depression designs). Not all formerly depressed persons would be expected to have exhibited the

cognitively mediated subtype of depression featured in Beck's and hopelessness theory (Abramson & Alloy, 1990; Abramson et al., 1989) and thus, only a subset of remitted depressives would possess the putative information-processing biases reflective of cognitive vulnerability (Just et al., submitted). An alternative strategy for identifying information-processing effects associated with cognitive vulnerability is to use a behavioural high-risk design (Alloy, Lipman, & Abramson, 1992; Just et al., submitted) in which one directly selects nondepressed persons with and without the negative cognitive styles featured as diatheses in the cognitive theories of depression and then compares these high and low cognitive risk groups for differences in their processing of self-referent stimuli. This is the approach we adopted in the present study. Of course, further support for the vulnerability status of information-processing biases associated with maladaptive cognitive styles depends on demonstrating that those cognitive styles are themselves associated with past or future depression.

Second, from the perspective of Beck's theory and hopelessness theory, an association between self-report assessments of cognitive styles and laboratory task assessments of information-processing is important because negatively biased processing of self-referent material is presumed to be a mediating mechanism by which depressive self-schemata or inferential styles increase vulnerability to depression. If depressive cognitive styles do, in fact, increase the likelihood of depressive symptoms through their effects on encoding, interpretation, and/or retrieval of personally relevant material, then cognitively vulnerable and invulnerable individuals should differ in their self-referent information-processing. In particular, relative to persons at low cognitive risk for depression, high cognitive risk persons should be more likely to exhibit greater processing of negatively valenced and less processing of positively valenced, depression-relevant information about the self.

Finally, the issue of whether self-referent processing differences are associated with the presence versus absence of dysfunctional attitudes and inferential styles is significant from a methodological perspective. In his cogent appraisal of self-schema studies in depression, Segal (1988) argued that self-report questionnaires such as the DAS are not optimal for assessing cognitive vulnerability as represented by self-schemata, in part, because they may reflect fluctuations in negative verbalisations rather than underlying cognitive structure. Similarly, other investigators (e.g. Ingram & Reed, 1986; McCabe & Gotlib, 1993) have criticised self-report measures of cognitive vulnerability as subject to individuals' motivations and expectations or as only likely to tap conscious or controlled cognitive processes, whereas cognitive vulnerability may be reflected more strongly in automatic cognitive-processing (Hartlage, Alloy, Vazquez, & Dykman, 1993; Ingram et al., 1995; Ingram, Partridge, Scott, & Bernet, 1994b;

Teasdale, 1983, 1988). To the extent that negative versus positive attitudes and inferential styles as measured by the DAS and a revised ASQ are associated with actual differences in self-referent information-processing as measured by laboratory tasks adapted from cognitive psychology, the construct validity of both the self-report questionnaires and the laboratory information-processing tasks is increased. Several studies have reported significant correlations between DAS scores and other self-report measures of presumed cognitive biases (e.g. Blackburn, Jones, & Lewin, 1987; Giles & Rush, 1983; Hollon, Kendall, & Lumry, 1986); however, whether such associations would also occur when the cognitive biases are assessed with information-processing tasks remains to be investigated.

We assessed self-referent information-processing both in depression-relevant and depression-irrelevant content domains because Beck's (1967, 1987) theory suggests that depression-prone individuals have specific negative self-schemata related, for example, to autonomous themes of incompetence, worthlessness, and low motivation, but do not have negative schemata in all content domains (Dykman, Abramson, Alloy, & Hartlage, 1989; Greenberg & Alloy, 1989; McClain & Abramson, 1995). Thus, Beck's content-specificity hypothesis would suggest that information-processing biases should be limited to stimulus material congruent with the content embodied in the self-schemata.

Overview of the Present Study and Hypotheses

To examine whether individuals with maladaptive attitudes and inferential styles do, in fact, process information about themselves more negatively than do those with positive styles, we gave a Self-referent Information Processing (SRIP) Task Battery to high and low cognitive risk participants in the Temple–Wisconsin Cognitive Vulnerability to Depression (CVD) Project (Alloy & Abramson, submitted). In the CVD Project, university freshmen who were nondepressed and had no other current Axis I psychopathology at the outset of the study, but who were selected to be at high or low risk for depression based on their cognitive styles, were followed prospectively every 6 weeks for 2 years and then every 16 weeks for 3 more years with assessments of stressful life events, cognitions, and symptoms and diagnosable episodes of psychopathology. The SRIP Battery was administered at the start of the prospective phase of the project. The battery consisted of four tasks based on the work of Derry and Kuiper (1981) and Markus (1977) that yielded five dependent measures: judgements ("Me/Not Me") of self-descriptiveness of trait words; response latencies for these decisions; behavioural descriptions; behavioural predictions; and incidental recall of the trait words. Each task utilised four types of stimuli representing a 2 (Valence) × 2 (Content) design: Positively and

negatively valenced stimuli that were either relevant or irrelevant to a depressive self-concept. Consistent with cognitive theories of depression, we hypothesised that relative to low cognitive risk participants, high cognitive risk participants would show better processing of negative words (i.e. greater and faster endorsement, more behavioural descriptions, higher behavioural predictions, and higher correct recall) and less processing of positive words. Moreover, based on Beck's content specificity hypothesis, we predicted that these risk group differences would be more pronounced for depression-relevant than irrelevant content domains. Thus, we predicted a Risk × Content × Valence triple interaction on each of the self-referent processing measures.

METHODS

Participants

Participants for the CVD Project were selected based on a two-phase screening procedure. In Phase I, we administered the Cognitive Style Questionnaire (CSQ), a revision of the ASQ (Seligman et al., 1979) that assesses styles for inferring causes, consequences, and self-characteristics for hypothetical positive and negative events, the DAS (Weissman & Beck, 1978), and a demographics questionnaire to 5378 freshmen at Temple University (TU) and the University of Wisconsin (UW). The CSQ and DAS assess the cognitive diatheses featured in hopelessness theory and Beck's theory, respectively. Potential participants were screened through classes, dormitories, campus activities, and campus media advertisements from 9/90 to 6/92. Freshmen with scores in the highest quartile (most negative) of the Phase I screening sample on *both* the DAS and CSQ composite of the stability, globality, consequences, and self-dimensions for negative events were designated the potential high-risk (HR) group; whereas those with scores in the lowest quartile (most positive) on *both* the DAS and CSQ negative event composite were the potential low-risk (LR) group.

A random subset of the 619 HR and 585 LR freshmen who met the Phase I criteria and were less than 30 years old were invited for the Phase II screening, in which they were administered the current episode and lifetime portions of a modified Schedule for Affective Disorders and Schizophrenia–Lifetime (mod-SADS-L) interview (Endicott & Spitzer, 1978). A total of 313 Phase I-eligible HR and 236 LR freshmen participated in the Phase II screening. Participants were excluded from the final sample if they met *Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition-Revised* (DSMIII-R; APA, 1987) *or* Research Diagnostic Criteria (RDC; Spitzer, Endicott, & Robins, 1978) for any of the following based on the

mod-SADS-L: (1) Current diagnosis of any episodic mood disorder [e.g. major (MD) or minor (MiD) depressive disorder, bipolar disorder (Bi) with a current episode of either MD or mania (Ma) or hypomania (Hyp)] or any chronic mood disorder [e.g. dysthymia (Dys), intermittent depressive disorder (IDD), or cyclothymia (Cyc)]; (2) Current diagnosis of any other psychiatric disorder (e.g. anxiety disorder, alcohol or drug use disorder); (3) Current psychotic symptoms; (4) Past history of Ma, Hyp, Bi, or Cyc; and (5) Serious medical illness that would preclude participation in a longitudinal study. Freshmen who met DSMIII-R or RDC criteria for a past unipolar mood disorder (e.g. past MD, MiD, Dys, IDD), but who had remitted for a minimum of two months, were retained in the final sample in order not to be left with an unrepresentative sample of HR participants.[2] The 209 eligible HR and 207 eligible LR participants who met all of the Phase II criteria were invited to participate in the prospective phase of the CVD Project. Of these eligible participants, 17 HR and 13 LR refused participation in the prospective phase and another 19 HR and 18 LR were dropped by us prior to entry into the prospective follow-up period.[3] The final CVD Project sample included 173 HR (83 at TU; 90 at UW) and 176 LR (87 at TU; 89 at UW) freshmen. The final sample was administered the SRIP Task Battery, along with the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) at the outset of the prospective phase (Time 1), within one month of the Phase II screening.

Table 1 displays demographic and cognitive style characteristics of the final sample at each site. The two cohorts were similar on sex ratio and the cognitive style measures across the sites, but differed on ethnic composition and socioeconomic status (SES), as indicated by parental education and income. The TU cohort had a significantly higher proportion of minority participants (37.1%; 26.4% Afro-American, 3.6% Hispanic, 4.2% Asian, 3.0% Other) than did the UW cohort (6.2%; 1.7% Afro-

[2] Our logic in including participants who were nondepressed currently but had a past depression is that by excluding such people, we might be excluding the very people who are most likely to develop the hypothesised cognitively mediated subtype of depression (e.g. hopelessness depression). If Beck's theory and hopelessness theory are correct, then HR participants, by virtue of their negative cognitive styles, should more often be at risk and thus more likely to have experienced past depression than LR participants (a result we did obtain: Alloy et al., submitted). If we excluded such individuals, we might be left with an unrepresentative HR group consisting of participants, who, despite possessing very negative cognitive styles, do not readily become depressed, perhaps because they have other protective factors. Thus, in order not to bias the CVD Project against the cognitive theories by possibly excluding participants who are at risk for hopelessness depression, we included nondepressed participants with past depression.

[3] Participants were dropped from the study for any of three reasons: inability to locate the participant; five or more missed appointments; or poor English-speaking ability.

TABLE 1
Final CVD Project Sample: Demographic and Cognitive Style Characteristics

Temple site	*High-risk (N = 83)*		*Low-risk (N = 87)*	
DAS mean item score	4.39	(.55)	2.17	(.29)
CSQ-NEG. COMP. mean item score	5.05	(.47)	2.71	(.43)
Age (yrs)	18.45	(1.40)	19.57	(2.98)
Average parental educ. (yrs)	13.76	(2.47)	13.45	(2.26)
Combined parental income	$48,061	($36,013)	$39,882	($25,906)
Sex	67.5% F		66.7% F	
Ethnic group	68.3% Cauc.		57.7% Cauc.	
Wisconsin site	*High-risk (N = 90)*		*Low Risk (N = 89)*	
DAS mean item score	4.50	(.44)	2.23	(.33)
CSQ-NEG. COMP. mean item score	5.15	(.40)	2.78	(.37)
Age (yrs)	18.67	(.37)	18.77	(1.14)
Average parental educ. (yrs)	15.20	(2.17)	15.03	(2.27)
Combined parental income	$82,911	($100,473)	$71,782	($53,219)
Sex	68.9% F		67.4% F	
Ethnic group	95.6% Cauc.		92.1% Cauc.	

Note: DAS, Dysfunctional Attitudes Scale; CSQ-NEG. COMP., Cognitive Style Questionnaire Composite for Negative Events; standard deviations are in parentheses.

American, 0.6% Hispanic, 3.4% Asian, 0.6% Other), [$\chi^2(1) = 47.97$, $P < .0001$]. The TU cohort also had lower mean parental education and combined parental income than did the UW cohort [$F(1,333) = 36.50$, $P < .0001$] for parental education, and [$F(1,263) = 18.26$, $P < .0001$] for parental income.[4] The HR and LR groups did not differ on sex, ethnic composition, or SES, but the LR group was significantly older than the HR group [$F(1,342) = 10.33$, $P < .002$], and the men were older than the women [$F(1,341) = 5.90$, $P < .02$]. In addition, there was a significant Risk × Site interaction [$F(1,341) = 7.38$, $P < .01$], in which the TU LR group was older than the TU HR group and the UW LR and HR groups.

The final sample did not differ significantly from the Phase I screening sample on age or ethnic composition, but did have a higher proportion of women (67.1% at TU; 68.2% at UW) than did the Phase I screening sample (56.8% at TU; 60.7% at UW), [$\chi^2(1) = 9.86$, $P < .01$]. In turn, the Phase I screening samples did not differ from the entire freshmen classes at each university on age or ethnic composition, but also had a higher proportion of women than the freshmen classes as a whole (51% women at each university). The female bias in both the Phase I screening sample and our final

[4] The degrees of freedom for the comparison on parental income are small because many participants did not provide this information.

sample is probably due to women being more likely than men to volunteer for research studies in general. Our final sample also did not differ significantly on demographics or CSQ and DAS scores from eligible participants who either refused participation or were dropped by us prior to the prospective phase of the project. Thus, the final sample of HR and LR participants was generally representative of the populations from which it was drawn on demographics (but obviously not on cognitive styles) and was unbiased relative to other eligible freshmen who did not participate in the prospective phase. Further details regarding the rationale for: screening, characteristics, and representativeness of the CVD Project sample may be found in Alloy and Abramson (submitted).

Screening Instruments

Cognitive Style Questionnaire (CSQ; Abramson, Metalsky, & Alloy, in prep). The CSQ is an expanded and modified version of the ASQ (Seligman et al., 1979) that assesses the degree to which individuals make internal, stable, and global attributions for 6 positive and 6 negative achievement and interpersonal events. There were two major modifications of the ASQ to create the CSQ. First, the number of hypothetical events was increased to 12 positive and 12 negative (6 achievement and 6 interpersonal of each) events of relevance to college students. Second, ratings of two additional inferences featured as vulnerabilities to depression in the hopelessness theory (Abramson et al., 1989) were added about each of the 24 events: inferences about the consequences and self-worth implications of the events. Mean item scores on the CSQ can range from 1 to 7. Internal consistency for the CSQ composites (stability + globality + consequences + self-implication) for positive and negative events is good, with alphas = .86 and .88, respectively. Predictive validity data for the CSQ are presented later (see Validation of Cognitive Risk Status). The CSQ composite score for negative events was used in conjunction with the DAS to select HR and LR participants for the CVD Project.

Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978). The DAS is a 40-item self-report questionnaire that is designed to assess maladaptive attitudes involving concern with evaluation, perfectionistic standards of performance, causal attributions, and so on. It is used frequently as a measure of the content of self-schemata relevant to depression. The DAS has demonstrated reliability and validity in both student and patient samples (e.g. Dobson & Breiter, 1983; Hammen & Krantz, 1985). The DAS was used along with the CSQ to select HR and LR participants at Phase I.

Modified SADS-L Interview (Endicott & Spitzer, 1978). A modified SADS-L interview was used to make current and lifetime RDC and DSMIII-R diagnoses of depression and other disorders at the Phase II screening; participants who met criteria for any current Axis I disorder were excluded from the final sample. The SADS-L interview was modified for the CVD Project as follows. (1) We added additional probes to allow for DSMIII-R as well as RDC diagnoses. (2) We added additional items that assessed the precise number of days a person felt depressed and for what percent of waking hours each day he/she felt depressed. (3) We expanded and improved on the probes in the anxiety disorders section by incorporating aspects of the Anxiety Disorders Interview Schedule (DiNardo et al., 1985). (4) We grouped together all items relevant to a given diagnosis and presented items about past episodes of a given disorder immediately after the items for a current episode of that disorder; participants found this modified format less confusing. All project interviewers were *blind* to participants' risk group status. They participated in an intensive interviewer training program for the administration of the mod-SADS-L (and the other project interviews) and the assignment of DSMIII-R and RDC diagnoses modelled after ideal programs (Amenson & Lewinsohn, 1981; Gibbon, McDonald-Scott, & Endicott, 1981). Inter-rater reliability was calculated by means of the kappa statistic (Cohen, 1960). Based on joint ratings of 80 mod-SADS-L interviews, we obtained kappas $\geq .90$ for all diagnoses. Further details regarding the mod-SADS-L, interviewer training, diagnostic calibration, and diagnostic reliability may be found in Alloy and Abramson (submitted) and Alloy et al. (submitted).

Beck Depression Inventory (BDI; Beck et al., 1961). The BDI was administered at the start of the prospective phase of the project, along with the SRIP Task Battery, to assess initial levels of depressive symptoms. The BDI has high internal consistency, test-retest reliability, and validity with both psychiatric and normal samples (Beck, Steer, & Garbin, 1988).

Selection and Matching of Self-referent Task Stimuli

Depression-relevant (competence, self-worth, motivation) and irrelevant (politeness, predictability) content domains were those used successfully by Greenberg and Alloy (1989) and McClain and Abramson (1995). Potential depression-relevant domains were initially generated based on clinical descriptions of the depressive self-concept (e.g. Beck, 1967; Bibring, 1953; Lewinsohn, 1974; Seligman, 1975), whereas potential irrelevant or control domains were never mentioned in clinical descriptions of the depressive self-concept. We then administered a Self Percep-

tion Questionnaire (SPQ; Greenberg & Alloy, 1989), consisting of bipolar adjective dimensions from each of the potential relevant and irrelevant domains, to a separate sample of 156 undergraduates along with the BDI. Those dimensions that most strongly correlated with BDI scores were chosen as the final depression-relevant domains for the present study, whereas those dimensions that were uncorrelated with BDI scores were chosen as the final irrelevant domains.[5]

Next, we generated a list of 250 words (mostly adjectives), 15 corresponding to the positive (e.g. competence) and 15 corresponding to the negative end-point (e.g. incompetence) of each of the 3 relevant and 2 irrelevant domains. We specifically avoided words that were affect descriptors (e.g. blue, dejected). Another separate sample of 170 undergraduates, unselected for depressed mood, rated each word on its degree of relationship to each of the positive and negative domains. The final pool of 80 words (8 for each of the positive and negative endpoints of the 5 relevant or irrelevant domains), contained those that were rated as most highly related to one domain and least highly related to the other domains. The positive words in the depression-relevant and irrelevant domains were equated for likeableness (Anderson, 1968), as were the negative words in the relevant and irrelevant domains. Finally, the words in each of the 4 Content × Valence sets [i.e. negative depression-relevant (NDR), positive depression-relevant (PDR), negative depression-irrelevant (NDI), positive depression-irrelevant (PDI)] were equated on word length and word frequency. Two equivalent forms (Form A and B) of 40 words each (12 NDR, 12 PDR, 8 NDI, 8 PDI), equated on word length, frequency, and likeableness, were created for use in the CVD Project to minimise practice effects when the SRIP Task Battery was repeated at yearly intervals during the prospective follow-up phase. The present findings are based on the first administration of the SRIP Battery (Form A) at the outset of the prospective phase. Table 2 presents the final set of words.

Procedure for the Self-referent Information Processing (SRIP) Task Battery

Participants were tested individually. The following four tasks, yielding five dependent measures, were completed as follows.

[5] Although we had generated several potential depression-irrelevant domains, only two of these domains (politeness and predictability) did not correlate empirically with BDI scores in our pre-test sample. Thus, we only used these two irrelevant domains in the SRIP Task Battery.

TABLE 2
Word Stimuli used in the Self-referent Information Processing Task Battery (SRIP)

Category	*Content Domain*	*Form A*	*Form B*
Positive Depression-relevant	Competence	competent	successful
		resourceful	confident
		intelligent	effective
		capable	qualified
	Motivation	motivated	enthusiastic
		active	ambitious
		dynamic	vigorous
		energetic	industrious
	Self-worth	worthy	good
		important	useful
		valuable	lovable
		winner	deserving
Negative Depression-relevant	Incompetence	failure	incompetent
		stupid	incapable
		ineffective	weak
		unskilled	unable
	Lack of motivation	lazy	unmotivated
		indifferent	lethargic
		passive	inactive
		apathetic	uninspired
	Worthlessness	bad	worthless
		nobody	unvaluable
		useless	unimportant
		unlovable	loser
Positive Depression-irrelevant	Politeness	polite	amiable
		courteous	thoughtful
		civil	congenial
		tactful	friendly
	Predictability	predictable	dependable
		reliable	prompt
		consistent	methodical
		steady	cautious
Negative Depression-irrelevant	Rudeness	offensive	rude
		nosy	impolite
		thoughtless	crude
		boastful	hostile
	Unpredictability	erratic	unpredictable
		irrational	wild
		frivolous	inconsistent
		fickle	changeable

Self-descriptiveness Judgements and Latency. The trait words in Form A were presented to participants on Macintosh computers that were programmed to record two dependent variables: response choices and response times (RTs). Words were presented with an inter-stimulus interval of 4 seconds and each remained in the centre of the computer monitor until the participant responded. Participants were instructed to press the "Me" button on the computer keyboard if they believed the word was self-descriptive or the "Not Me" button if they judged that the word was not self-descriptive. The "Z" and "/" keys on the keyboard were labelled "Me" and "Not Me", counterbalanced so that half of the participants had the "Me" button on the right side (/ key) and half had it on the left side (Z key). Participants rested their index fingers on the response buttons when they were not responding. Participants were instructed to make their judgements according to how they usually viewed themselves and their RTs were recorded without their awareness. Each of the 40 words was presented twice in a different random order for each participant, with the condition that the entire set was presented once before any word was repeated.[6] The 40 target words presented twice were preceded and followed by 5 practice words, designed to familiarise participants with the task and to minimise primacy and recency effects in the later incidental recall task.

Behavioural Descriptions. In Task 2, each participant received a booklet (Form A) containing the same three words, chosen at random, from each of the 4 Content × Valence types from Task 1. For each word they judged to be self-descriptive, they were asked to provide specific evidence of their own past behaviours that indicated why the word described them. For example, if a participant believed he/she was incompetent, he/she had to provide specific examples of past incompetent behaviours in his/her life. Markus (1977) found that behavioural examples are more accessible when an individual has a self-schema in that content domain. Participants were given unlimited time for this task and were asked to provide as many examples of past behaviour as possible. The dependent measure was the number of behavioural examples provided per word judged to be self-descriptive for each of the 4 Content × Valence types of words.

[6] The target words were each presented twice in order to examine the consistency of participants' "Me/Not Me" judgements. Prior studies have found more consistent "Me" judgements for content congruent with the self-schema (e.g. MacDonald & Kuiper, 1984). Participants' responses ("Me/Not Me") to the two presentations of the target words were consistent 96% of the time. Therefore, we simply combined the data from both presentations for purposes of analysis. Exclusion of the 4% of the cases with discrepant responses does not change any of the results reported here.

Behavioural Predictions. In Task 3, participants read 24 statements (Form A) describing hypothetical behaviours in each of the 4 Content × Valence types of domains (6 PDR, 6 NDR, 6 PDI, 6 NDI statements), for example, "You give an in class presentation and communicate your ideas clearly" (competence, PDR), or "You give up your seat on the bus for an old woman" (politeness, PDI). They were asked to judge on a 0% to 100% scale the probability that they would behave or react in the way described if they were in that situation in the future. The mean probability judgement for each of the four types of domains was the dependent measure. Markus (1977) reported that individuals give higher predictions for statements describing behaviours that are congruent with the content embodied in their self-schemata.

Free Recall. Task 4 was an incidental free recall test for the words participants had judged "Me" or "Not Me" in Task 1. The recall test followed Task 1 with a delay of two hours. Participants were handed a blank piece of lined paper and were instructed to recall in any order as many of the words they had seen on the computer monitor in Task 1 as they could. They were given five minutes for their free recall. The dependent measure was the proportion of words in each of the 4 Content × Valence categories that were correctly recalled.

RESULTS

Validation of Cognitive Risk Status

In order to validate that the cognitive HR and LR groups do, in fact, differ in their vulnerability to depression, we present *briefly* CVD Project data on the lifetime prevalence and prospective incidence of episodic unipolar depressive disorders here. The reader is referred to Alloy et al. (submitted) and Alloy and Abramson (1995) for the more detailed presentation and analysis of these data as well as data on other forms of psychopathology. Based on the mod-SADS-L interviews conducted at the Phase II screening, HR participants had significantly higher lifetime prevalences than LR participants of DSMIII-R major depression [42% vs. 17%; $F(1,340) = 27.7$, $P < .0001$], RDC major depression [40% vs. 16%; $F(1,340) = 29.4$, $P < .0001$], RDC minor depression [27% vs. 13%; $F(1,340) = 11.2$, $P < .001$], and of the subtype of hopelessness depression [46% vs. 13%; $F(1,340) = 50.9$, $P < .0001$]. In addition, *preliminary* prospective data based on the first two years of follow-up at the TU site only indicated that the HR group also had higher prospective incidence than the LR group of DSMIII-R major depression [17% vs. 5%; $F(1,161) =$

5.9, $P < .02$], RDC major depression [13% vs. 6%; $F(1,161) = 2.1$ $P < .15$], RDC minor depression [37% vs. 16%; $F(1,161) = 8.4$, $P < .004$], and hopelessness depression [39% vs. 16%; $F(1,161) = 10.3$, $P < .002$]. Moreover, the prospective incidence differences were even greater among the TU subsample with no prior history of depression: 22% HR vs. 0% LR for DSMIII-R major depression [$F(1,73) = 12.5$, $P < .001$]; 12% HR vs. 1% LR for RDC major depression [$F(1,73) = 3.4$, $P < .07$]; 28% HR vs. 7% LR for RDC minor depression [$F(1,73) = 4.8$, $P < .03$]; and 34% HR vs. 7% LR for hopelessness depression [$F(1,73) = 7.1$, $P < .01$]. Thus, HR participants were more vulnerable than LR participants to episodic unipolar depressive disorders and to the hypothesised cognitively mediated subtype of depression, in particular.

Overview of Hypothesis Testing Approach

Our hypothesis testing strategy involved three parts. First, we examined whether the critical predicted Risk × Content × Valence interaction was significant using an approach that was conservative in two respects. First, to protect against inflated experiment-wise error rate due to multiple statistical tests, we tested the predicted interaction by conducting a Risk (HR, LR) × Sex (male, female) × Site (TU, UW) × Content [depression-relevant (DR), depression-irrelevant (DI)] × Valence [positive (P), negative (N)] repeated-measures multivariate analysis of variance (MANOVA) on the five dependent measures (judgements, RTs, behavioural descriptions, behavioural predictions, and correct recall). As will be seen later, the Risk × Content × Valence interaction was significant in the MANOVA; thus, we then felt justified in examining further this interaction in individual ANOVAs on each of the dependent variables.[7] The second way in which our approach was conservative was that we used two-tailed tests of significance, despite the fact that we had clear-cut directional predic-

[7] For dependent measures in which it was possible to examine participants' information-processing as a function of their responses ("Me/Not Me") on the self-descriptiveness judgement task (i.e. RTs and correct recall), we included Response as a factor in the ANOVA design. This allowed us to determine whether the pattern of decision times and recall was opposite for words judged self-descriptive vs. non-descriptive. Given that participants should exhibit faster RTs and better recall for words consistent with the content embodied in their self-schemata (e.g. NDR words judged "Me" and PDR words judged "Not Me" by HR participants vs. PDR words judged "Me" and NDR words judged "Not Me" by LR participants), we expected an opposite pattern of RTs and recall performance for "Me" vs. "Not Me" positively and negatively valenced words. Thus, for RTs and correct recall, we conducted Risk × Sex × Site × Content × Valence × Response repeated-measures ANOVAs.

tions. Significant interactions (or marginal interactions if predicted) in the ANOVAs on individual dependent measures were decomposed with simple effects tests. As the second component of our hypothesis testing strategy, in both the initial MANOVA and the subsequent ANOVAs on individual dependent measures, we examined whether the predicted Risk × Content × Valence interaction (or the predicted Risk × Content × Valence × Response interaction, see footnote 7) was further modified by any higher order interactions involving Sex or Site. We did not decompose interactions that did not further modify or otherwise compromise the interpretation of the predicted interactions involving Risk Group.[8]

The third component of our hypothesis testing strategy was designed to investigate whether any residual differences in depressive symptom levels between HR and LR participants at the time of the SRIP Task Battery could account for our risk group effects. Thus, we reconducted both the initial MANOVA and the ANOVAs on the individual dependent measures with the BDI as a covariate. We report whether the predicted Risk × Content × Valence interaction (or 4-way interaction with Response) remains significant with the BDI as a covariate and whether the BDI interacts with Content and Valence (and Response) in the same way that Risk does. Inasmuch as the HR and LR groups differed on age, we computed Pearson correlations to test whether age predicted any of the dependent measures. Given that age did not predict any of the dependent measures significantly (*r*s ranged from −.106 to .102, n.s.), it was not necessary to include age as a covariate in the analyses. Degrees of freedom differ slightly across the ANOVAs on individual dependent variables due to missing data on some measures.

SRIP Task Battery Analyses

MANOVA Results. The Risk × Sex × Site × Content × Valence repeated-measures MANOVA on judgements of self-descriptiveness, RTs for these judgements, behavioural descriptions, behavioural predictions, and correct recall yielded the following significant multivariate effects: Risk [$F(4,298) = 8.30$, $P < .0001$]; Site [$F(4,298) = 15.71$, $P < .0001$]; Content [$F(4,298) = 43.12$, $P < .0001$]; Valence [$F(4,298) = 515.10$, $P < .0001$]; Risk × Content [$F(4,298) = 2.74$, $P < .03$]; Risk × Valence

[8] Given the complexity of our experimental design potentially allowing for multiple higher order interactions, we only present the decomposition of the theoretically predicted interactions involving Risk or interactions that further modify the predicted interactions involving Risk in order not to detract from a clear description of the theoretically meaningful findings.

[$F(4,298) = 13.77$, $P < .0001$]; Sex × Content [$F(4,298) = 2.91$, $P < .03$]; Site × Content [$F(4,298) = 35.10$, $P < .0001$]; Content × Valence [$F(4,298) = 13.83$, $P < .0001$]; Risk × Content × Valence $F(4,298) = 4.26$, $P < .002$]; Sex × Content × Valence [$F(4,298) = 2.77$; $P < .03$]; and Site × Content × Valence [$F(4,298) = 3.45$, $P < .01$]. All of these effects remained significant, including the critical predicted Risk × Content × Valence interaction [$F(4,295) = 3.59$, $P < .007$], when the BDI was included as a covariate in the analysis and, in turn, the BDI × Content × Valence interaction was not reliable [$F(4,295) = 0.24$, n.s.]. Given that the predicted Risk × Content × Valence interaction was significant and was not modified by higher order interactions with Sex or Site, we examined this interaction further in ANOVAs on the individual dependent measures.

Judgements of Self-descriptiveness. A Risk × Sex × Site × Content × Valence ANOVA on the proportion of words of each type judged as self-descriptive (i.e. "Me") yielded the predicted Risk × Content × Valence interaction [$F(1,325) = 10.38$, $P < .001$], unmodified by any higher order interactions. Further, this interaction remained significant [$F(1,300) = 3.98$, $P < .05$], when the BDI was included as a covariate and the BDI × Content × Valence interaction was not significant [$F(1,300) = 0.48$, n.s.]. Table 3 displays the means and standard deviations (SDs) for the proportion of "Me" judgements. To examine whether the interaction conformed to prediction, we decomposed it. The Risk × Valence 2-way interaction was significant both for DR content [$F(1,325) = 42.98$, $P < .0001$], and DI content [$F(1,325) = 9.92$, $P < .002$], although it was stronger for DR content. As predicted, HR participants endorsed fewer positive DR (PDR) words [$F(1,325) = 41.25$, $P < .0001$], and more negative DR (NDR) words, [$F(1,325) = 26.08$, $P < .0001$], than did LR participants. They also endorsed fewer positive DI (PDI) words [$F(1,325) = 8.59$, $P < .004$], and more negative DI (NDI) words [$F(1,325) = 4.44$, $P < .04$], than LR participants, but the group differences were smaller for the DI words.

Response Times (RTs) for Self-descriptiveness Judgements. The ANOVA on RTs included Response (Me/Not Me) as a factor because we expected the pattern of decision times to be opposite for words judged "Not Me" versus "Me" (see footnote 7). The predicted Risk × Content × Valence × Response interaction was significant for RTs [$F(1,326) = 12.29$, $P < .001$], and was not modified further by Sex or Site. This 4-way interaction was still significant when the BDI was included in the ANOVA [$F(1,323) = 10.48$, $P < .001$], and the BDI × Content × Valence × Response interaction was not reliable [$F(1,323) = 0.10$, n.s.]. The RT means and SDs are shown in Table 3. To examine whether the interaction

TABLE 3
Words Judged "Me" and "Not Me" and Response Times for these Judgements

	Low Risk		*High Risk*	
	Mean	*(SD)*	*Mean*	*(SD)*
Self-descriptiveness judgements				
Me response				
Positive DR	.92	(.02)****	.78	(.02)
Negative DR	.09	(.01)****	.17	(.01)
Positive DI	.86	(.01)***	.80	(.01)
Negative DI	.19	(.02)**	.23	(.02)
Not Me response				
Positive DR	.08	(.01)****	.22	(.01)
Negative DR	.91	(.02)****	.83	(.02)
Positive DI	.14	(.01)***	.20	(.01)
Negative DI	.81	(.02)**	.77	(.02)
Response times for judgements				
Me response				
Positive DR	1902.45	(121.55)****	2581.40	(123.47)
Negative DR	4261.83	(249.34)*	3633.00	(253.29)
Positive DI	2250.89	(178.67)	2536.16	(181.50)
Negative DI	3563.76	(267.69)	3841.50	(271.93)
Not Me response				
Positive DR	4574.49	(253.94)*	3957.64	(257.96)
Negative DR	2205.97	(108.69)***	2656.48	(110.41)
Positive DI	3323.84	(141.52)	3881.27	(143.76)
Negative DI	2492.17	(98.29)	2898.43	(99.85)

Note: DR, depression-relevant; DI, depression-irrelevant. Response times are given in msecs. Proportion of "Not Me" judgements are the inverse of proportion of "Me" judgements.

*$P < .10$; ** $P < .05$; *** $P < .01$; **** $P < .001$.

conformed to prediction, we conducted separate analyses for words judged "Me" and "Not Me" and found that the Risk × Content × Valence interaction was reliable for both "Me" [$F(1,326) = 5.29$, $P < .02$], and "Not Me" words [$F(1,326) = 8.18$, $P < .005$]. Simple effects tests showed that the Risk × Valence interaction was significant for DR content for both "Me" [$F(1,326) = 12.31$, $P < .001$], and "Not Me" rated words [$F(1,326) = 8.49$, $P < .004$], but not for DI content for either type of response. As predicted, compared to the LR group, the HR group was significantly slower in responding "Me" to PDR words [$F(1,326) = 15.36$, $P < .001$] and "Not Me" to NDR words [$F(1,326) = 8.46$, $P < .004$]. They also showed a trend to be faster than the LR group in responding "Me" to NDR words [$F(1,326) = 3.13$, $P < .08$] and "Not Me" to PDR words [$F(1,326) = 2.90$, $P < .09$].

Behavioural Descriptions. The Risk × Content × Valence interaction was also significant in the ANOVA on behavioural descriptions [$F(1,321) = 6.67$, $P < .01$], and was not modified further by Sex or Site (see Table 4 for means and SDs). This interaction remained significant when the BDI was added as a covariate [$F(1,319) = 5.12$, $P < .03$], and the BDI did not interact with Content and Valence [$F(1,319) = 0.12$, n.s.]. We decomposed the interaction to determine whether it conformed to prediction. The 2-way Risk × Valence interaction was significant for DR content [$F(1,321) = 6.93$, $P < .009$], but not for DI content. As predicted, HR participants tended to provide fewer behavioural examples from their past lives for why PDR words were self-descriptive [$F(1,321) = 3.54$, $P < .06$], and more past behavioural examples for why NDR words were self-descriptive [$F(1,321) = 3.64$, $P < .06$], than did LR participants.

TABLE 4
Behaviour Descriptions and Behaviour Predictions

	Low Risk		*High Risk*	
	Mean	*(SD)*	*Mean*	*(SD)*
Behaviour descriptions				
Behaviour examples				
Positive DR	2.39	(.09)*	2.14	(.10)
Negative DR	0.56	(.04)*	0.67	(.04)
Positive DI	1.63	(.07)	1.78	(.08)
Negative DI	0.15	(.04)	0.26	(.04)
Words judged self-descriptive				
Positive DR	2.80	(.46)****	2.44	(.86)
Negative DR	0.73	(.55)**	0.87	(.69)
Positive DI	2.47	(.72)**	2.30	(.79)
Negative DI	0.22	(.58)***	0.45	(.77)
Behaviour predictions				
Positive DR	78.21	(0.97)****	71.66	(1.00)
Negative DR	20.44	(1.09)****	38.12	(1.13)
Positive DI	79.60	(1.14)***	75.10	(1.18)
Negative DI	23.45	(1.55)****	33.56	(1.61)

Note: DR, Depression-relevant; DI, Depression-irrelevant. For the behaviour descriptions task-behaviour examples, the numbers in the table represent the number of behavioural examples provided per self-descriptive word for each type of content. For the behaviour descriptions task-words judged self-descriptive, the numbers in the table represent the number of words out of 3 possible for each type of content that were judged as self-descriptive. For behaviour predictions, the numbers in the table represent the predicted probability (0–100%) of future behaviour for each type of content.

*$P < .06$; ** $P < .05$; *** $P < .01$; **** $P < .001$.

Behavioural Predictions. There was also a significant Risk × Content × Valence interaction on behavioural predictions [$F(1,322) = 11.58$, $P < .001$], unmodified by Sex or Site, that remained significant when the BDI was in the analysis [$F(1,320) = 7.38$, $P < .007$]. Moreover, the BDI × Content × Valence interaction was not reliable [$F(1,320) = 0.45$, n.s.], (see Table 4 for means and SDs). Again, to test whether the interaction conformed to prediction, we decomposed it. The Risk × Valence interaction was highly significant for both DR [$F(1,322) = 84.56$, $P < .0001$] and DI content [$F(1,322) = 22.33$, $P < .0001$], although the effect was stronger for DR content. As hypothesised, HR participants predicted that they would be more likely to behave in negative DR ways [$F(1,322) = 127.54$, $P < .0001$] and negative DI ways [$F(1,322) = 20.55$, $P < .0001$], and less likely to behave in positive DR ways [$F(1,322) = 22.03$, $P < .0001$] and positive DI ways [$F(1,322) = 6.99$, $P < .01$] in the future than did LR participants.

Correct Recall. Given that we expected the pattern of recall of "Me" and "Not Me" rated words to be mirror images of each other (see footnote 7), we included Response as a factor in the ANOVA on the proportion of words correctly recalled. The 4-way Risk × Content × Valence × Response interaction was significant for correct recall [$F(1,319) = 4.66$, $P < .03$], was not modified further by Sex or Site, and remained significant with the BDI in the analysis [$F(1,316) = 3.95$, $P < .05$]. The BDI × Content × Valence × Response interaction was not significant [$F(1,316) = 0.02$, n.s.], (recall means and SDs are displayed in Table 5). We decomposed this interaction to test whether it conformed to prediction. The Risk × Content × Valence interaction was almost significant for "Me" rated words [$F(1,319) = 3.51$, $P < .06$], but was not reliable for "Not Me" rated words [$F(1,319) = 2.60$, $P < .11$].[9] For "Me" rated words, the Risk × Valence interaction was reliable for DR content [$F(1,319) = 8.29$, $P < .004$], but not for DI content. Whereas HR and LR participants did not differ in their recall of negative DR words judged "Me" [$F(1,319) = 2.20$, n.s.], the HR group recalled significantly fewer positive DR words judged "Me" than the LR group [$F(1,319) = 6.46$, $P < .01$].

[9] Given that the Risk × Content × Valence interaction for "Not Me" rated words was quite marginal, we examined this interaction in an exploratory fashion. The Risk × Valence interaction for "Not Me" words was reliable for DR content [$F(1,319) = 5.17$, $P < .02$], but not for DI content. The HR group recalled more positive DR words judged "Not Me" than the LR group [$F(1,319) = 13.91$, $P < .0001$], but the risk groups did not differ in their recall of negative DR words judged "Not Me".

TABLE 5
Correct Recall

	Low Risk		*High Risk*	
	Mean	*(SD)*	*Mean*	*(SD)*
Proportion of words recalled				
Me response				
Positive DR	.30	(.01)***	.26	(.01)
Negative DR	.05	(.01)	.06	(.01)
Positive DI	.28	(.01)	.29	(.01)
Negative DI	.05	(.01)	.07	(.01)
Not Me response				
Positive DR	.02	(.01)****	.06	(.01)
Negative DR	.17	(.01)	.17	(.01)
Positive DI	.04	(.01)	.04	(.01)
Negative DI	.14	(.01)	.14	(.01)
Actual number of words recalled				
Me response				
Positive DR	3.58	(1.52)	3.16	(1.75)
Negative DR	0.60	(0.74)	0.78	(0.92)
Positive DI	2.17	(1.10)	2.31	(1.24)
Negative DI	0.36	(0.64)	0.54	(0.84)
Not Me response				
Positive DR	0.30	(0.63)	0.78	(1.23)
Negative DR	2.10	(1.24)	2.15	(1.32)
Positive DI	0.30	(0.63)	0.28	(0.65)
Negative DI	1.12	(1.07)	1.13	(1.09)

Note: DR, Depression-relevant; DI, Depression-irrelevant. Analyses were performed only on the proportion of words recalled because the number of words recalled for each type of content is confounded by different numbers of words seen in the relevant vs. irrelevant categories.

*** $P < .01$; **** $P < .001$.

DISCUSSION

To summarise our major findings, relative to participants at low cognitive risk for depression, those at high cognitive risk for depression exhibited greater processing of negative self-referent information and less processing of positive self-referent information. This was evidenced by a significant Risk × Content × Valence (or Risk × Content × Valence × Response) interaction on the overall MANOVA and on all five of the individual information-processing measures. Moreover, there was some evidence that risk group differences in self-referent processing were greater for depression-relevant than for depression-irrelevant content. Specifically, HR participants were more likely to endorse as self-descriptive, tended

to be faster in endorsing, retrieved more past behavioural examples of, and tended to correctly recall more self-descriptive negative depression-relevant words than LR participants. In addition, HR participants predicted that they would be more likely to engage in future negative depression-relevant behaviours than LR participants. Perhaps even more consistent across the different dependent measures, HR participants also were less likely to endorse as self-descriptive, were slower in endorsing, retrieved fewer past behavioural examples of, predicted less future behaviour in the domain of, and correctly recalled fewer positive depression-relevant words than LR participants. Indeed, a perusal of the means displayed in Tables 3–5 shows that both HR and LR participants exhibited preferential endorsement, processing, and retrieval of positive over negative self-referent information; HR participants simply showed significantly less of this processing bias in favour of positive self-referent material than did LR participants. The consistency of the pattern of self-referent processing biases exhibited by HR versus LR participants across the dependent measures is impressive and gives added confidence to the reliability of the findings. It is also noteworthy that the risk group differences in self-referent processing remained even when current levels of depressive symptoms were controlled and that participants' depressive symptom levels did not interact with the content and valence of the stimuli in the same manner as did their cognitive styles. These findings suggest that the self-referent processing differences associated with cognitive risk status are not attributable to any residual differences in HR and LR participants' depressive symptoms.

Our finding of self-referent information-processing differences between individuals who were at high versus low cognitive risk for depression based on their dysfunctional attitudes and inferential styles has important theoretical and methodological implications for cognitive theories of depression (e.g. Abramson et al., 1989; Beck, 1967, 1987). First, the findings indicate that negatively toned self-referent processing previously demonstrated to be characteristic of depressed individuals (e.g. Derry & Kuiper, 1981; Gotlib & Cane, 1987; Greenberg & Beck, 1989; Ingram et al., 1994b; Segal, 1988) also occurs among persons who are hypothesised to be vulnerable to depression by virtue of possessing negative cognitive styles. Given that these negative cognitive styles were found to be predictive of past and future depressive episodes in the CVD Project, our findings suggest that negatively biased processing of information about the self may also be an indicator of cognitive vulnerability to depression. Of course, further evidence that relatively negative encoding and retrieval of self-referent information provides vulnerability to depression would come from studies that showed that such negatively biased processing itself predicted future depressive episodes. Second, the fact that differences in

participants' cognitive styles predicted concomitant differences in the way they processed information about themselves is consistent with, although not fully demonstrative of, the hypothesis that negative cognitive styles may function to increase vulnerability to depression in part through mechanisms such as encoding, accessibility, and memory for self-referent information. That is, the relatively negative information-processing biases observed in HR participants serve to elaborate more fully the concept of negative cognitive style. With future prospective data from the CVD Project, it will be possible to test directly whether the ability of participants' cognitive risk status to predict prospective onsets of depressive episodes either alone or in interaction with stressful life events is mediated, at least in part, by their differential self-referent information-processing. Finally, from a methodological perspective, the present findings are significant because they provide converging evidence for information-processing effects of cognitive styles on laboratory tasks adapted from cognitive science paradigms (e.g. Ingram & Reed, 1986; McCabe & Gotlib, 1993; Segal, 1988). As such, the findings further support the construct validity of the cognitive style questionnaire measures employed here and in many other studies of cognition and depression.

That HR participants showed less preferential processing of positive versus negative self-referent information than LR participants is reminiscent of a related finding in the depression literature. Whereas nondepressed persons have been found to be highly susceptible to "self-serving" or "beneffectance" biases (e.g. Bradley, 1978; Greenwald, 1980; Miller & Ross, 1975), in which they take credit for successes and deny responsibility for failures and attribute more positive than negative characteristics to themselves, depressed persons often fail to succumb to such asymmetric biases or show them to a smaller degree (Alloy & Abramson, 1988). The present findings suggest that the reduced asymmetry of positive over negative self-referent processing associated with depression may also be characteristic of persons who are cognitively vulnerable to depression but are not currently in a depressive episode. Future research will be needed to determine whether individuals who are cognitively vulnerable to depression also exhibit reduced susceptibility to other forms of self-serving biases.

In addition, based on Beck's (1967) content specificity hypothesis and earlier work demonstrating that depressed individuals do not possess negative self-schemata in all content domains (e.g. Dykman et al., 1989; Greenberg & Alloy, 1989; McClain & Abramson, 1995), we hypothesised that risk group differences would be more pronounced for depression-relevant content involving themes of competence, self-worth, and motivation than for depression-irrelevant domains of politeness and predictability. Although there were larger HR–LR differences in processing positive and

negative depression-relevant stimuli than positive and negative depression-irrelevant stimuli, respectively, on the judgement, RT, behaviour descriptions, predictions, and recall measures (see Tables 3–5), HR and LR participants did, in fact, also differ significantly on the irrelevant stimuli on the judgement and behaviour prediction measures. It is of interest that the two measures on which we obtained risk group differences in the processing of depression-irrelevant content may both be viewed as intentional tasks, in which the individual makes a conscious decision about self-descriptiveness or a conscious prediction about likely future behaviour. In contrast, two of the measures (RTs and recall) on which there were no risk group differences in the processing of irrelevant content involved tasks that were incidental to the participants' adjective rating task and thus participants were unaware that their RTs or memory for the words would be assessed. Cognitive conceptualisations of depression emphasise the automatic nature of self-schema based processing (Ingram et al., 1994b, 1995). It is possible that whereas individuals who are cognitively vulnerable to depression may consciously endorse or predict any negative characteristic about themselves, they may only unintentionally elaborate and process negative self-referent information that is congruent with core themes embodied in their self-schemata.

Limitations of the Present Study and Directions for Future Research

In interpreting the present findings, it is important to recall that participants' status, with respect to cognitive vulnerability, was determined on the basis of both dysfunctional attitudes (representing cognitive vulnerability in Beck's theory) and inferential styles (representing cognitive vulnerability in hopelessness theory). Therefore, it is not possible to determine whether the relatively negative self-referent processing biases associated with high cognitive risk status obtained here are attributable to the presence of dysfunctional attitudes alone, negative inferential styles alone, or some combination of both.

Although we obtained predicted differences in the processing of self-referent depression-relevant content as a function of cognitive vulnerability status on all five of our dependent measures, a stronger and theoretically more consistent test of the cognitive theories' information-processing predictions would involve an examination of self-referent processing in the context of life events. According to the hopelessness theory of depression (Abramson et al., 1989), individuals hypothesised to be cognitively vulnerable to depression by virtue of possessing a depressogenic inferential style are hypothesised to engage in negatively biased self-referent processing in response to negative life events. Similarly, the dysfunctional

attitudes featured as a vulnerability factor in Beck's (1967; Beck et al., 1979) theory involve self-worth contingencies in which maladaptive self-referent conclusions are dependent on the occurrence of certain negative situations (e.g. making a mistake or others' disapproval). Consequently, a more clear-cut prediction of these cognitive theories is that negatively toned self-referent processing in cognitively vulnerable individuals would occur in the context of negative events, but not positive events. Moreover, both Beck's theory and the hopelessness theory contain a "specific vulnerability" or "matching" hypothesis in which negative events that are congruent with the content of the depression-prone individual's inferential style or self-schema (e.g. a social rejection for a sociotropic or interpersonally vulnerable person) are especially likely to elicit negatively biased information-processing and, ultimately, depression. Although the present demonstration of self-referent processing differences between cognitively vulnerable and invulnerable individuals provides important support for the cognitive theories of depression, we hope that future investigations of information-processing biases associated with depression-proneness will go beyond the present study by providing more fine-grained tests of the theories' hypotheses regarding the eliciting role of vulnerability-congruent negative life events in negative self-referent processing biases.

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