

## Future-Event Schemas: Automaticity and Rumination in Major Depression

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*We examined the proposition that individuals with major depression make predictions about future events relatively automatically and pessimistically, reflecting use of a future-event schema, while they also ruminate about the future. Depressed participants and nondepressed controls indicated whether or not various positive and negative future events would happen to them or to an average other—either under a concurrent attentional load or no such load—while their response latencies were assessed. As hypothesized, depressives showed relatively greater automaticity in their predictions than did nondepressives, and a lack of optimism as well. More specifically, depressives showed a smaller increase in response latency due to the introduction of the attentional load than did nondepressives, suggesting relatively greater processing efficiency, and they also predicted reliably fewer positive events. Indeed, depressives also reported ruminating more about the future based on a recent distressing life event. Overall, the results extend research on future-event schemas and automaticity (Andersen, Spielman, & Bargh, 1992) from moderate to major depression and establish a link with future-event rumination.*

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**KEY WORDS:** depression; rumination; schemas; cognition.

Cognitive theories of depression suggest that hopeless expectations about the future play a fundamental role in depression (e.g., Abramson, Metalsky, & Alloy, 1989; Abramson, Seligman, & Teasdale, 1978; Beck, 1967, 1976). According to Beck (1967, pp. 256–261), a negative cognitive triad of beliefs, about the self, the world, and the future, plays an etiological role in depressed mood (although purely cognitive models of depression have, of course, been challenged, e.g., Coyne & Gotlib, 1983; Haaga, Dyck, & Ernst, 1991). These three types of beliefs are interrelated and yet they are also conceptually distinct. One's ideas about the future are not identical to one's views of the self, nor to one's perceptions of the world. Indeed, views about the self do not always generalize even to views about others (e.g.,

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Alloy & Ahrens, 1987; Bargh & Tota, 1988). Hence, cognitions about the future and cognitions about the self cover different territory.

According to Beck (1967, 1976), patterns of self-interpretation in depression can be conceived in terms of self-schemas, mental representations of past experiences and generic knowledge about the self. Indeed, much research has examined and demonstrated the operation of self-schemas in depression (e.g., Bargh & Tota, 1988; Hammen, Marks, de Mayo, & Mayol, 1985; Segal, Gemar, Truchon, Guirguis, & Horowitz, 1995; Segal, Hood, Shaw, & Higgins, 1988; Teasdale, Taylor, Cooper, Hayhurst, & Paykel, 1995; Zuppan, Hammen, & Jaenicke, 1987; for reviews see, Haaga et al., 1991; Segal, 1988).<sup>3</sup> However, in spite of widespread acknowledgment of the role of self-schemas in depression, and acceptance of the cognitive triad in depression more broadly, little research has systematically examined the operation of other elements of the triad or the notion that schematic knowledge about *future events* ought to exist among depressives.

In our view, the way depressives think about future events is of importance because the manner in which future events are anticipated is integral to hopelessness (Andersen & Lyon, 1987; Andersen, Spielman, & Bargh, 1992; Garber, Miller, & Abramson, 1980; Hollon & Garber, 1980). Hopelessness has been central to each revision of the learned helplessness model (Abramson et al., 1978, 1989) and evidence suggests that depressives do in fact hold more pessimistic or hopeless expectations about the future than do nondepressives, perceiving positive events as less likely and negative events as more likely (Alloy & Ahrens, 1987; Andersen, 1990; Andersen & Schwartz, 1992; MacLeod & Cropley, 1995; Pietromonaco & Markus, 1985; Pyszczynski, Holt, & Greenberg, 1987; Reich & Weary, in press; Riskind, Rholes, Brannon, & Burdick, 1987).

The present research extends work on hopelessness in which this construct is defined in terms of *depressive predictive certainty*, or the tendency to see future suffering as inevitable. This work has shown a strong association between such depressive predictive certainty and naturally occurring depression, in that moderate depressives appear to feel certain that positive events will not occur and that negative events will (Andersen, 1990; Andersen & Schwartz, 1992; see also Andersen & Lyon, 1987). One implication is the possibility that depressives may have well-established knowledge that enables them to make quick judgments about the future in the form of a *future-event schema*.

Research on *self-schemas* among mild to moderate depressives has demonstrated automaticity in negative judgments about the self (e.g., Bargh & Tota, 1988), and research has begun to address the operation of *future-event schemas* among depressives as well. Specifically, the latter research has demonstrated that moderately depressed persons (college students) show *automaticity* in their predictions about the future, whereas nondepressed people do not (Andersen et al., 1992). In each case, this automatic processing involves relatively effortless judgments that do not require much attention.

<sup>3</sup>Schemas are generally conceptualized as well-organized, highly efficient knowledge structures that operate relatively effortlessly. Hence, we assume that schematic processing involves such ease in processing as one aspect of *automaticity* (Bargh, 1989; Bargh & Tota, 1988; Hasher & Zacks, 1979).

More broadly, automaticity has been shown to have multiple components, including effortlessness or efficiency, uncontrollability, unintentionality, and unconsciousness (Bargh, 1989, 1994), components that do not necessarily cooccur. Hence, to require a process to have *all* features of automaticity, rather than a particular feature, would be to define it out of existence. Of course, competing models of automatic processing also exist. That is, automaticity may arise based on the buildup of large numbers of relevant instances in memory through repeated experience and practice with a stimulus or procedure such that this produces a special ease of retrieval reflected in automatic processing (e.g., Logan, 1988; Schmidt & Bjork, 1992; Smith, 1989, 1994). By contrast, automaticity may be based on limits in attentional capacity that favor judgments based on recently or frequently used mental representations (e.g., Bargh, 1989; Higgins & Bargh, 1987; Kahneman, 1973). Regardless, the general notion shared by these competing models is that automatic processes involve a relatively rapid, effortless ease of retrieval and use of stored knowledge (procedural or declarative). Automatic cognitive processes should thus occur unabated in spite of other tasks requiring attention that must be performed simultaneously (in a dual-task paradigm), and there should be a continuum of such automaticity rather than it being all-or-none. Prior research on future-event schemas among depressives has assessed relatively effortless processing (Andersen et al., 1992), as did the present research.

In previous research on future-event schemas, participants were asked to make yes–no judgments about whether or not various positive and negative events would happen either to them or to an average other, while their response latencies were assessed, and they did this task either under a concurrent attentional load or no such load. The results showed that these moderately depressed participants were more pessimistic in that they predicted fewer positive events and more negative events than did either mild depressives or nondepressives. They also made their future-event predictions with greater automaticity, overall, as defined in terms of effortlessness in processing. That is, introducing the attentional load did not reliably increase depressives' response latencies in predicting future events (whether positive or negative), whereas the introduction of the attentional load did reliably increase the response latencies of both mild depressives and nondepressives (again for both positive and negative future events). Such evidence provides a clear demonstration of automaticity in the future-event predictions of moderate depressives.<sup>4</sup>

This evidence thus suggests that moderate depressives possess a future-event schema—a well-defined set of expectations about the future that are relatively pessimistic—enabling especially efficient processing of information about the future (Andersen et al., 1992; Reich & Weary, in press). By contrast, both nondepressives

<sup>4</sup>The assessment of response latency in such a dual-task paradigm allows for assessment of effortlessness as an element of automatic processing (Bargh, 1989, 1994). Tasks that proceed relatively effortlessly should not show interference effects based on an attentional load. That is, they should show less interference than do tasks that require effort. If a process requires little attention or effort, it should be less affected by an attention-demanding task (Andersen et al., 1992). This is the case because *accessibility* and ease in use of particular representations should not be driven by *strategic* processing, and should be relatively effortless and relatively undemanding of attention. A dual-task paradigm of this kind is thus useful in assessing relative processing ease or effortlessness regardless of which model of automaticity is adopted (Kantowitz, 1974; Logan, 1979).

and mild depressives appear not to hold a schematized view of the future. In fact, nondepressives appear to be quite uncertain of the future and not in the least schematized, quite appropriate given that the future is unknown. That is, although self-schemas exist both for depressives and for nondepressives, differing largely in content (Bargh & Tota, 1988; although see Higgins, Van Hook, & Dorfman, 1988), only depressives schematically organize future-event knowledge in memory; nondepressives do not.

Our assumption is that a mental structure enabling automatic future-event predictions is formed among depressives on the basis of the well-practiced process of attempting to anticipate and predict future events (Andersen et al., 1992; Reich & Weary, in press), and our approach is thus most consistent with a practice-effects view of automaticity (Logan, 1988; Schmidt & Bjork, 1992; Smith, 1989). In this sense, rumination about the future should be at the root of automatic thoughts about the future among depressives, through the mechanism of practice effects. Rumination in depression is thought to involve a cascade of negative cognitions, creating still more intrusive thoughts (Beck, 1967, 1976; Beck, Rush, Shaw, & Emery, 1979; Nolen-Hoeksema, 1991). Future-event schemas may thus result in part from relatively intentional, ruminative thought about the future based on negative life events (Andersen et al., 1992), especially if depression is a course that begins with increasing rumination about the future which then deepens the depression and eventually enables automaticity in future-event predictions. The notion that mild depressives may actually *seek certainty* in particular ways is supported by research on social-perception processes among depressives (Weary & Edwards, 1994), and rumination may seem to reduce uncertainty. Interestingly, depressives who engage in rumination may do so because they believe it will help them to understand themselves and solve their problems, while in fact it serves to maintain or even exacerbate their depression (Lyubomirsky & Nolen-Hoeksema, 1993; Nolen-Hoeksema, 1991). Although the full implications of our model could not be assessed in the present research, the research does extend prior work on future-event schemas in depression and constitutes a preliminary effort to examine automaticity in conjunction with rumination, all among individuals with major depression.

As pessimistic ideas about the future become elaborated and well rehearsed through strategic rumination, ideas about the future should come to mind relatively effortlessly, in an increasingly nonreflective and involuntary way. Numerous studies suggest that self-focused rumination maintains and exacerbates depression (e.g., Ingram, Lumry, Cruet, & Sieber, 1987; Larsen & Cowan, 1988; Musson & Alloy, 1988; Pyszczynski, Hamilton, Herring, & Greenberg, 1989; Smith, Ingram, & Roth, 1985). When depressives ruminate, they show increases in depression in both correlational studies (Nolen-Hoeksema, Morrow, & Fredrickson, 1993) and experimental studies (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema & Morrow, 1993). However, they show less depression when they engage in distraction, whereas among nondepressives, neither rumination nor distraction has these affective impacts.

In addition, both laboratory and naturalistic studies have shown that depressives are especially likely to ruminate, and, perhaps as part of this, that they

come to express more negative expectations about the future, endorse more negative interpretations of events, and give more self-defeating explanations for negative events (e.g., Gibbons et al., 1985; Nolen-Hoeksema, Parker, & Larson, 1994; Pyszczynski et al., 1987, 1989). More broadly, a strong, positive relationship has been shown between rumination and depression severity and duration, giving evidence of the importance of rumination in depression (Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 1993, 1994).

In the present research, we extended research on future-event schemas among moderate depressives into the realm of major depression, and examined future-event rumination as well. We used an assessment tool enabling DSM-IV diagnosis of major depression (American Psychiatric Association, 1994), and randomly assigned depressed participants and controls to an attentional load or no-load condition in which they made *yes* or *no* predictions about a variety of positive and negative future events either concerning the self or concerning an average other (Andersen et al., 1992). Our design and our measurement of response latency enabled us to study the *process* by which future-event judgments are made by people with major depression, that is, its relative automaticity as defined in terms of effortlessness. This extends beyond the simple yes or no content of such judgments, and in general beyond self-reported "automatic thoughts," which index pessimism rather than on-line processing (Segal, 1988; see also Hartlage, Alloy, Vazquez, & Dykman, 1993).

In this work, we hypothesized that individuals with major depression would show relatively more automaticity in their future-event predictions than would nondepressives. This would be shown if the increase in latency due to load (versus no load) in making future-event predictions was smaller for depressives than for nondepressives. We thus predicted this effect in response latency for predictions about both positive and negative events. Practice in making future-event predictions should lead to a special ease of retrieval of future-event information and of prior predictions among depressives due to a buildup of instances of practice in attempting to predict the future (see also Logan, 1988; Smith, 1989, 1994). Hence, relatively greater automaticity should be found among individuals with major depression. Such evidence would directly demonstrate "automatic thoughts" about the future in major depression and would suggest relatively more use of future-event schemas as well. Of course, we also predicted relatively greater pessimism in the yes-no responses of participants in predicting positive or negative events, as in prior work. Greater rumination based on a negative life event was also predicted. Moreover, the potential cooccurrence of rumination and future-event automaticity in major depression would provide further grist for the speculation that ruminative processes may underlie the formation of future-event schemas.

## METHOD

### Participants and Overview

College students with major depression were selected from a diverse population of undergraduates at an urban university, in accordance with the DSM-IV specifica-

tions (American Psychiatric Association, 1994), by means of their scores on a validated instrument to diagnose major depression (Zimmerman, Coryell, Corenthal, & Wilson, 1986). Thirty-seven undergraduates (22 females, 15 males) enrolled in an introductory psychology course participated in partial fulfillment of a course requirement. They ranged in age from 18 to 26 years with a mean age of 19.4 years and were 65% (24) White, 22% (8) Asian American, 5% (2) African American, 5% (2) Hispanic, and 3% (1) Native American.

Although research on depression conducted with college students has evoked controversy because of questionable applicability to major depression (for reviews, see Coyne, 1994; Coyne & Gotlib, 1983; Gotlib, 1984; Vredenburg, Flett, & Krames, 1993), we carefully preselected for individuals with major depression in the present study. Depressives were preselected on the basis of their scores on the Inventory to Diagnose Depression (IDD; Zimmerman et al., 1986), administered as part of a mass testing session prior to the experiment, and readministered at the end of the experiment, from 2 to 22 weeks later, with an average of 9 weeks elapsing, to ensure that all depressed participants remained clearly classifiable as "cases" of major depression in the experiment. As this implies, participants with major depression are likely to have been symptomatic for at least 1 month and up to 6 months and not likely to have been subsyndromal. Although we cannot rule out dysthymic disorder among these participants, this does not pose a problem in our effort to tap "caseness" in depression.

Participants were classified as having *major depression* if they scored 22 or greater on the IDD, equivalent to a score of 16 or higher on the BDI, and if they met the DSM-IV diagnostic criteria for major depression, including the 2-week symptom duration. All participants retained their major depression classification both during the preselection phase and later in the experiment, showing consistency over time. Participants were classified as nondepressed if they scored 11 or below on the IDD at both assessment times. Given the similarity of the IDD and the BDI, the IDD classification of nondepressives in this study was comparable to that used in prior studies (e.g., Andersen et al, 1992), but "caseness" in major depression made the present depressed participants different from those in related prior studies.<sup>5</sup> The study included 20 participants qualifying for a diagnosis of major depression and 17 nondepressives, with a mean IDD score of 35.6 in major depression ( $SD = 9.7$ ; range = 23–59), equivalent to a BDI score of 27 (excluding "caseness"), and 4.5 in the nondepressed group ( $SD = 4.0$ ; range = 0–11), equivalent to a BDI score of 3.5.

In the microcomputer-based experiment, participants were asked to make judgments about whether or not each of various positive or negative future events was likely to happen to them or to the average student. In addition, both depressed and nondepressed participants were randomly assigned to a concurrent attentional

<sup>5</sup>DSM-III criteria specify that either dysphoric mood (defined as sad mood, irritability, or hopelessness) or anhedonia (loss of interest or pleasure in usual activities) must be present for a diagnosis of Major Depression. DSM-IV requires either dysphoric mood or anhedonia, but not hopelessness or irritability. Thus, the scoring algorithm for the IDD was modified so that items indexing dysphoria, sad mood, or anhedonia were consistent with DSM-IV criteria for a major depressive episode (Goldston et al., 1990; Zimmerman and Coryell, 1994).

load condition or to a no-load condition within which they made these predictions (modeled after Andersen et al., 1992; Bargh & Tota, 1988). Afterward, all participants completed a questionnaire about rumination.

### Instrument for Assessing Depression

The IDD (Zimmerman & Coryell, 1987) is a self-report measure that assesses the symptoms of major depression and their duration so as to identify cases of major depression according to DSM-IV. To meet criteria for Major Depressive Disorder, respondents must endorse at least five items from nine symptom clusters and must indicate having had all symptoms for at least 2 weeks. Endorsed items must also have a clinical severity of at least 2 on a scale of 0–4 or at least 3 for loss of interest or loss of pleasure (see below).

The IDD contains 22 items, each covering one symptom using five relevant self-statements arranged in order of severity, modeled after the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Respondents are asked to pick the statement that best describes how they have felt over the past week. The IDD diagnoses Major Depressive Disorder according to DSM-IV. Although it was originally designed in accordance with DSM-III (American Psychiatric Association, 1980), a simple change in the scoring algorithm enables DSM-IV diagnosis.<sup>6</sup> Each item yields a score ranging from 0 to 4, with 0 representing no disturbance, 1 representing subclinical severity, and 2 or above representing clinical severity. Scores are summed to yield a total ranging from 0 to 88. (Each item on the BDI can range in severity from 0 to 3, and the measure yields a total score ranging from 0 to 63; Beck et al., 1979.) Importantly, the duration of each symptom is also measured, which is the main innovation that enables assessment of “caseness” in qualifying for a diagnosis of major depression. That is, respondents indicate whether or not the symptom has been present for more than 2 weeks. In addition, we employed the caution of including only participants who remained stable in their depression classification between the initial assessment and the end of the experiment (as suggested by Vredenburg et al., 1993; see also, e.g., Deardoff & Funabiki, 1985; Kendall, Hollon, Beck, Hammen, & Ingram, 1987; Kendall & Ingram, 1989; Tennen, Hall, & Affleck, 1995).

The IDD has excellent validity and reliability in mixed inpatient psychiatric samples (Zimmerman et al., 1986) and in community samples (Zimmerman & Coryell, 1987, 1988). Studies comparing the IDD with structured clinical interviews in diagnosing major depression have found high rates of agreement (Zimmerman & Coryell, 1987, 1994). Comparing diagnoses derived from the IDD and from the Diagnostic Interview Schedule (DIS; Robins, Helzer, Croughan, & Ratcliff, 1981) in a large community sample ( $n = 394$ ), the overall rate of agreement was 97.2%

<sup>6</sup>The highest score possible for an item on the BDI is 3, whereas for the IDD it is 4. On a separate topic, we calculated the IDD cutoff score for nondepressed participants using the number of highest possible scores allowable while remaining in the category. In prior work (e.g., Andersen, 1990; Andersen et al., 1992), 8 was the cutoff for nondepression (three scores of 3, minus a score of 1). On the IDD, this translates to a score of 11 (three scores of 4, minus a score of 1).

(Zimmerman & Coryell, 1987). For participants who completed the IDD within 1 week of the DIS ( $n = 211$ ), agreement increased to 98.1%, and the IDD showed high sensitivity in yielding true positives (80.0%, 4 of 5 cases) and high specificity in yielding true negatives (98.5%, 203 of 206 cases). Hence, the IDD is clearly a valid measure of major depression.

The IDD has been used with increasing frequency in recent years (e.g., Franche & Dobson, 1992; Goethe & Fischer, 1995; Hill & Knowles, 1991; McFarlane, Bellissimo, & Norman, 1995; Nolen-Hoeksema & Morrow, 1991; Prud'homme & Barron, 1992; Schlager, Froom, & Jaffe, 1995; Scott & O'Hara, 1993; Veiel, 1993; Williamson & Yates, 1989). It has been shown to be a stable, internally consistent, valid measure of depressive symptomatology among college students. Based on a large sample ( $n = 2,079$ ) of undergraduates (Goldston, O'Hara, & Schartz, 1990), the split-half reliability was .86 and Cronbach's alpha was .84. A subset of 57 students completing the IDD a second time 48 hr later showed a test-retest reliability of .92. A subset of 265 students completing the IDD 14 weeks later showed a test-retest reliability of .56. Importantly, a subset of 30 students took part in a comparison of IDD diagnoses and diagnoses derived from the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978) modified for DSM-III-R (American Psychiatric Association, 1987), showing overall agreement of 86.7% ( $\kappa = .67$ ), sensitivity of 70%, and specificity of 95.0%.

In addition, the prevalence rate of major depression using the IDD has been estimated to be 5.4% for men and 5.6% for women in this college population (Goldston et al., 1990), substantially lower than the 9–20% prevalence estimates of depression based on other self-report measures (Boyd & Weissman, 1981), and comparable to epidemiologic data on the 6-month prevalence estimates for major depression of 1.1–3.9% for men and 3.0–6.1% for women aged 18–24 years (Meyers et al., 1984). Thus, the IDD provides for a relatively accurate prevalence estimate of depression relative to other self-report inventories (Goldston et al., 1990; see also Coyne, 1994). Indeed, in the present study, of 1,298 students assessed in mass testing, 45 were classified as having major depression, yielding a prevalence rate of 3.47%, a rate comparable to that reported using interview measures. Moreover, of the 26 participants with major depression in the battery who agreed to participate in the experiment, only 17 remained depressed at the time of the experiment, suggesting our dual assessment criteria excluded participants whose depression was more fleeting.

### **Apparatus and Materials**

Thirty-two positive and negative future events (see Table I) were used as experimental stimuli, all rated by college students as moderately likely to be experienced by the average person (Andersen et al., 1992). Exceptionally likely and unlikely positive and negative events that would yield yes and no responses, respectively, with little variance were also included as fillers. All participants were exposed to the same set of future events, and equal numbers of positive and negative stimuli that were moderately likely, highly likely, or highly unlikely were randomly paired,



**Table 1.** Life Events That Participants Judged Would or Would Not Happen at Some Time in the Future by the Valence of the Event

Negative events	Positive events
Be stuck in a unfulfilling job	Cope successfully with job pressures
Regret a major life decision	Achieve life goals
Work with unpleasant people	Live a healthy and active life
Experience the death of a spouse	Live in an ideal home
Get a fatal disease	Do enjoyable things
Suffer a great financial loss	Have a sexually fulfilled life
Be unhappy in a long-term relationship	Have plenty of money
Have a nervous breakdown	Have an ideal job
Fail to contribute to society	Be satisfied with major life decisions
Be very lonely when old	Gain the respect of my colleagues
Eventually become senile	Fall in love
Cause someone to suffer	Help another person
Be divorced	Receive an award
Be hospitalized for an illness	Travel around the world
Get laid off	Be self-employed
Be betrayed by a friend	Get a promotion

on an individualized basis for each participant, with the self or the average other. The order of the stimuli to be judged was individually randomized for each participant. That is, the order of the target person judged (self vs. other), of event valence, and of specific items was completely randomized to ensure that participants would not develop any target expectancies that might artificially reduce response times (Bargh & Tota, 1988). As indicated, participants pressed yes or no on a response box for each future event while the computer automatically recorded both response content (yes or no) and latency (in milliseconds). In the attentional load condition, a microphone was placed on the table, ostensibly to record participants as they repeated aloud each random six-digit number, while the experimenter actually kept track of digit-response accuracy. Each future event was presented only once to each participant.

**Procedure**

*Experimental Instructions*

Participants took part individually, and were told that they would be asked whether or not a given event was likely to happen to them or to the average NYU undergraduate at some time in the future and that they should respond yes or no as quickly as possible while also responding as accurately as possible. Indeed, to prevent a speed-accuracy tradeoff, we also informed participants that we were more interested in the accuracy of each response than in its speed. Participants in the attentional load condition were told that, before each trial, a random six-digit number would appear on the screen that they would be asked to hold in mind while making each judgment and to say aloud into the microphone after each trial. Participants assigned to the no-load condition simply made each judgment without holding such a digit in mind.

Each trial began with the message "NEXT TRIAL FOLLOWS," which appeared on the computer monitor for 1 sec. After a delay of 1 sec, a prompt appeared centered near the top of the screen. In the attentional load condition, the prompt said "REMEMBER THESE DIGITS," and after a 1-sec delay, a random six-digit number was presented and remained on the screen for 2 sec. The screen was then cleared, there was another 1-sec delay, and the regular presentation of the trial occurred (to be described below). Once the participant responded yes or no, there was another 1-sec delay followed by the message "SAY THE 6-DIGIT NUMBER ALOUD NOW." The participant was then given 4 sec to repeat the six-digit number before the next trial.

For all participants, each judgment was preceded by one of two prompts, "IS THIS LIKELY TO HAPPEN TO YOU?" or "IS THIS LIKELY TO HAPPEN TO THE AVERAGE NYU STUDENT?" After 1 sec, the future event to be judged appeared. Participants responded by pressing yes or no, which terminated the display. After another 1 sec, the next trial began.

The experimenter was blind to participants' depression status throughout the experiment.

### *Accuracy of Digit Recall*

To ensure that depressed and nondepressed participants in the attentional load condition did not differentially take their attention away from the digit task in making their judgments, the accuracy of participants' memory for the six digits they held in mind during each trial was examined. For each of the 64 trials, digit-recall inaccuracy ranged from 6 (all six digits recalled incorrectly) to 0 (no digit recalled incorrectly). Analysis of the average number of errors participants made across all trials showed that there were no significant differences between nondepressed and depressed participants. The mean number of errors was 1.17 for nondepressives and 0.93 for major depressives,  $F(1,15) < 1$ .

### *Second Diagnostic Assessment*

Following all trials, participants again filled out the IDD to verify their depression group classification.

### *Rumination Questionnaire*

Participants then completed a measure of future-event rumination, based on a negative life event, created for the present research. The measure asked participants to report the most negative life event that had happened to them *within the last 2 weeks*, a period corresponding to the time during which we assessed depression (the same 2-week period), and to rate the negativity of that event. As an index of future-event rumination, we asked participants to rate three items tapping how much the event had led them to ruminate about the future, how much it had led to intrusive thoughts about the future, and how intense their thoughts were. We also assessed rumination about the self by asking participants to rate the same three questions about rumination about the self, the extent to which the event had led

them to wonder and think about what kind of person they are, and the intrusiveness and intensity of the thoughts. These latter factors are important in ruminative processes (Tait and Silver, 1989). All items were rated on 8-point scales.

To verify the notion that our separate rumination questions, about future and self, meaningfully captured these respective constructs, we conducted a factor analysis of these six items using varimax rotation. As predicted, two factors emerged, the first including the three items related to the self, with factor loadings of .77 or higher (a factor accounting for 43.7% of the variance), and the second including the three items related to the future, with factor loadings of .68 or higher (a factor accounting for 38.0% of the variance). Hence, future-event rumination and rumination about the self were examined as separate composite measures.

### *Ethical Issues*

Based on prior work in this area, we assumed that the effects of schema activation among depressives in this study would be minimal and transient. Nonetheless, a trained doctoral student in clinical psychology served as the experimenter in every session and was poised to detect and respond to any mood changes that might be evident (none were). Moreover, a department-wide decision was made to exclude any student from the study who scored high on suicidality, while making a referral to a clinical psychologist for evaluation and treatment. We followed this procedure at both administration times. However, no student reported suicidality or showed increases in depression in the experiment to warrant such action. Finally, we were instructed by our university human subjects committee not to discuss in our debriefing the preselection of participants for depression, so as not to trigger problematic issues for participants. We complied with this request.

## **RESULTS**

### **Response Latencies**

Before analyzing for automaticity, raw response latencies were trimmed so that any data points that were three standard deviations above the overall mean were treated as outliers, as is standard procedure in reaction-time analyses due to skew in these distributions (Ratcliff, 1993). This removed a small proportion of data points greater than 7818 msec for each participant, an inordinate amount of time to make this type of judgment, which would have otherwise introduced effort in our assessment of automaticity.

Participants' average response latency to predict events of each valence for self or other was examined in a  $2 \times 2 \times 2 \times 2$  (Depression  $\times$  Load  $\times$  Event Valence  $\times$  Self/Other) analysis of variance (ANOVA) with two repeated measures. We predicted greater relative automaticity (i.e., smaller increases in response latency due to load) among depressed participants than among nondepressed participants. If valence plays no role, the analysis should yield a two-way interaction between depression and load, and if it is relevant, a three-way interaction should emerge

involving event valence, and our contrasts should show that the load/no-load difference is smaller among depressives than among nondepressives.

The omnibus analysis yielded a reliable main effect for load,  $F(1,33) = 7.67$ ,  $p = .01$ , as expected, indicating longer latencies under load ( $M = 2774$  msec) than under no load ( $M = 1902$  msec). This shows that dual-task interference was in fact introduced. This analysis also yielded a main effect for valence,  $F(1,33) = 37.15$ ,  $p < .0001$ , indicating that, on average, predictions about positive events were made more quickly ( $M = 2073$  msec) than were predictions about negative events ( $M = 2534$  msec).

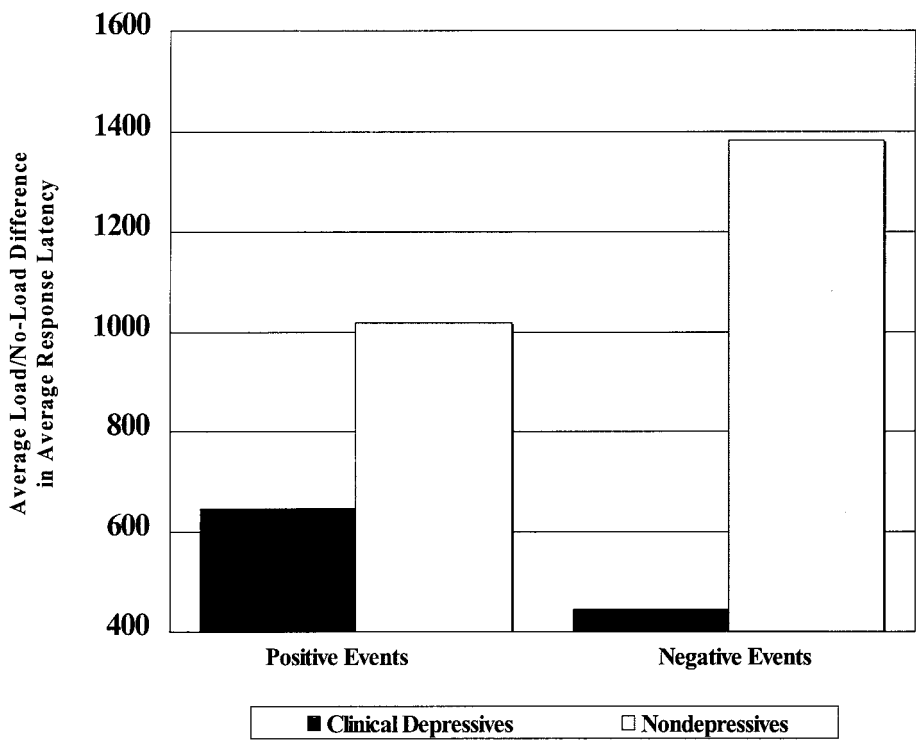
Turning to our main hypothesis, the two-way interaction between depression and load did not emerge,  $F(1,33) = 1.08$ ,  $p = .31$ . The analysis did, however, yield the same three-way interaction between depression, load, and event valence that emerged in prior work using this paradigm (Andersen et al., 1992), although it was marginally significant,  $F(1,33) = 3.39$ ,  $p = .08$ . Planned contrasts were conducted nonetheless to examine our specific predictions.<sup>7</sup> As predicted, and as portrayed in Fig. 1, the load/no-load difference in response latency was relatively smaller among participants with major depression than among nondepressed participants. That is, for predictions about negative events, depressives showed smaller increases in response latency due to load ( $M = 445$ ) than did nondepressives ( $M = 1381$ ),  $t(33) = 3.61$ ,  $p < .001$  ( $d = 1.19$ ), and the same effect held for positive events (major depression,  $M = 645$ ; no depression,  $M = 1017$ ),  $t(33) = 1.61$ ,  $p < .06$ , although the latter was marginal ( $d = .53$ ). (All reported contrasts are a priori and hence one-tailed.) This pattern of findings emerged with a medium to large effect size, and because automaticity is typically conceptualized in relative terms (Bargh, 1989, 1994), examining the degree to which automaticity is present in one group of participants relative to another for a given type of judgment makes sense. When judgments are made relatively automatically by a set of participants, the introduction of an attentional load condition should increase latencies relatively less than it does for the same judgments made by other participants. Hence, our evidence for a lesser magnitude in the load/no-load difference among participants with major depression relative to nondepressives is meaningful and suggests relatively more automaticity in making future-event predictions in major depression.

## Pessimism/Optimism in Yes–No Responses

### *Content of Future-Event Representations*

In conjunction with our main hypotheses concerning automaticity, it is important to examine the extent of self-reported pessimism in participants' positive and negative future-event predictions. To do this, we analyzed participants' yes–no responses to the various future events they judged, comparing the mean number

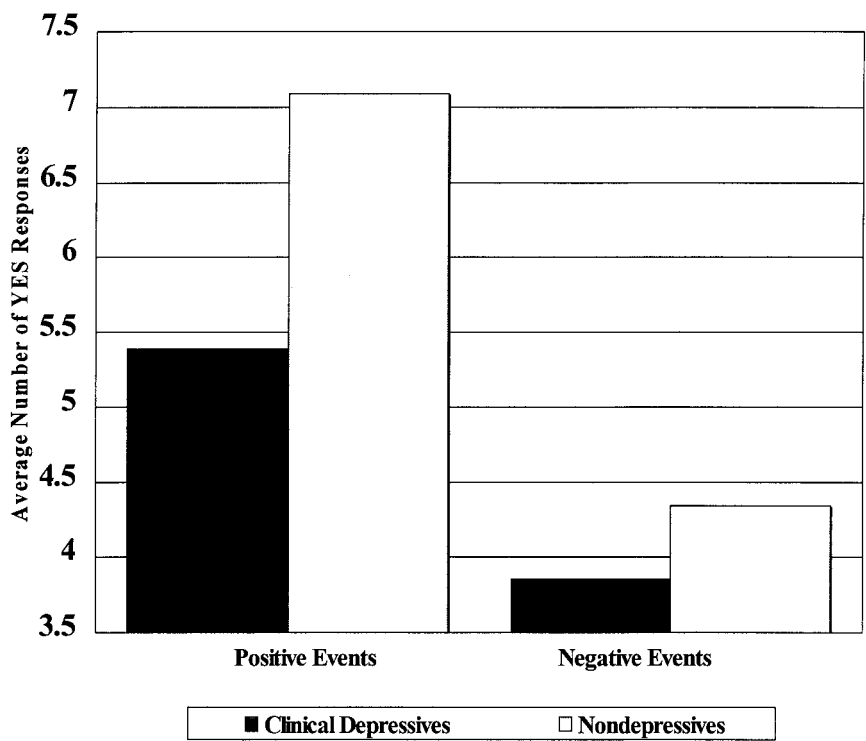
<sup>7</sup>In calculating these contrasts, we did not use the error term for the depression  $\times$  load  $\times$  event type interaction in this mixed-model design, as would be acceptable in a complete between-subjects factorial design. In a mixed-model design, this error term does not accurately estimate the error variance pertinent to the within-participant factor (i.e., future-event valence). Therefore, we conducted separate analyses for positive events and for negative event to obtain the proper error term for each such contrast.



**Fig. 1.** Difference between the load and no-load conditions in response latency to make predictions about positive and negative future events by participants' depression classification.

of yes responses to each type of event in the same  $2 \times 2 \times 2 \times 2$  ANOVA. The analysis yielded a marginal main effect for depression,  $F(1,33) = 3.87, p = .058$ , qualified by the predicted interaction between depression and event valence,  $F(1,33) = 7.73, p < .01$ , as portrayed in Fig. 2. Planned contrasts indicated, in fact, that participants with major depression said yes to fewer positive events ( $M = 5.39$ ) than did nondepressed participants ( $M = 7.09$ ),  $t(33) = 2.16, p < .05$  ( $d = .86$ ), and unlike prior results (Andersen et al., 1992), no reliable difference between groups in response to negative events (nondepressed,  $M = 3.85$ , depressed,  $M = 4.34, t < 1; d = .21$ ). These data suggest a lack of optimism in the participants with major depression in this study rather than pessimism per se. That is, the content of future-event predictions in major depression appears to be defined by the anticipation of fewer positive events than nondepressives anticipate.

The omnibus ANOVA also yielded other reliable findings. First, there was a main effect for event valence,  $F(1,33) = 29.61, p < .0001$ , such that, on average, participants predicted more positive ( $M = 6.18$ ) than negative events ( $M = 4.12$ ), although this finding was qualified by the interaction. Second, it yielded a main effect for the self–other factor,  $F(1,33) = 13.62, p < .001$ , which itself was qualified by an interaction between this factor and event valence,  $F(1,33) = 21.79, p < .0001$ . The latter indicated that participants predicted fewer negative events for themselves



**Fig. 2.** Average number of yes responses to positive and negative future events by participants' depression classification.

( $M = 3.14$ ) than for others ( $M = 5.11$ ). These additional findings do not compromise our central comparisons concerning depressives versus nondepressives.

*Relevance of Yes–No Responses to the Interpretation of Response-Latency Analyses*

The analysis of participants' yes–no responses showed no reliable interactions between load and other factors ( $F_s < 1$ ) nor a main effect for load, which generally allows one to interpret response latency differences between the load and no-load conditions in terms of automaticity (see Andersen et al., 1992).

**Rumination**

Given our interest in ruminative thought processes, participants' rating of each rumination item was examined in a  $2 \times 2$  (Depression  $\times$  Load) ANOVA. (No differences between major depressives and nondepressed participants were found in the perceived negativity of the life event reported for this rumination measure, which equates participants on this variable,  $F < 1$ .)

*Rumination About the Future and the Self*

Using a composite reflecting rumination about the future (with high interitem reliability across the three items,  $\alpha = .90$ ), the results showed that participants with major depression reported reliably more rumination about the future based on the negative event they listed ( $M = 5.40$ ) than did nondepressives ( $M = 3.08$ ),  $F(1,33) = 14.21, p < .001$ . Using a composite reflecting rumination about the self (again with high internal reliability,  $\alpha = .96$ ), participants with major depression also reported more rumination about themselves based on the event ( $M = 4.87$ ) than did nondepressives ( $M = 1.93$ ),  $F(1,33) = 18.86, p < .001$ . Hence, in major depression there was more rumination both about the future and about the self than with nondepressed participants. In conjunction with our evidence showing greater automaticity in the future-event predictions among major depressives relative to nondepressives, these data provide evidence that rumination both about the future and about the self cooccurs with automaticity in future-event predictions.

*Does Rumination About the Future Account for Future-Event Automaticity in Depression?*

Automatic future-event predictions among major depressives should be non-strategic, and self-reported rumination should thus *not* account for such effects. To explore whether or not self-reported rumination might account for the effects, we conducted the response-latency analysis again controlling for rumination about the future. Hence, the comparable analysis of covariance (ANCOVA) was conducted using a future-event–rumination composite as a covariate. This ANCOVA yielded essentially the same results. That is, it showed the main effects for load,  $F(1,32) = 9.06, p < .01$ , and event valence,  $F(1,32) = 4.95, p < .05$ , and the three-way interaction between depression, load, and event valence,  $F(1,32) = 3.13, p = .08$ . Thus, rumination about the future does not appear to account for the relative automaticity in the future-event predictions of depressives versus nondepressives.

**DISCUSSION**

Our central hypothesis in this research was confirmed, in that participants with major depression showed relatively greater automaticity in their future-event predictions than did nondepressives. Specifically, these depressed participants showed smaller increases in response latency under attentional load (relative to no-load) for both positive and negative events than did nondepressives. Indeed, their future-event predictions were also less optimistic than were those of nondepressives, in that these individuals were less likely to predict that positive events would occur, although equally likely to predict that negative events would not, suggesting no explicit pessimism in this sample. Moreover, and again as predicted, participants with major depression showed *more rumination* about the future than did nondepressives. Overall, the findings conceptually replicate evidence about automaticity in future-event predictions found among moderate depressives

(Andersen et al., 1992) and extend it to major depression, while linking it with future-event rumination.

The data suggest *future-event schemas among people with major depression that enable relatively effortless future-event predictions*. By contrast, nondepressives appear not to possess a well-developed knowledge structure concerning future outcomes, suggesting that such schemas are unique to depression. The data thus indicate that this element of Beck's (1967) negative cognitive triad is also represented schematically in memory. These findings also contribute to research on *automatic thoughts* in major depression, by measuring automaticity in future-events predictions. Although automatic thoughts are considered crucial in depression, their automatic nature has tended not to be examined (Segal, 1988; although see, e.g., Andersen et al., 1992; Bargh & Tota, 1988; Hartlage et al., 1993; Segal et al., 1998). Our design assessed relatively effortless processing using a dual-task attentional load paradigm that allowed us largely to rule out the role of strategic, effortful cognitive processing in future-event predictions.

To establish the connection between future-event automaticity and ongoing ruminative processes, we examined rumination about the future, and predicted that participants with major depression would report more future-event rumination than would nondepressives. This prediction was confirmed, suggesting that rumination about the future on the basis of recent negative life events cooccurs with relative automaticity in future-event predictions among major depressives, extending the literatures on automaticity, schematicity, and rumination in depression.

Broadly speaking, our results for major depression are consistent with those obtained for moderate depressives (Andersen et al., 1992), but some discrepancies are worth noting. In the current study, we obtained significant latency differences between the load and no-load conditions for both positive and negative events not only among nondepressed participants, but even among depressives. By contrast, these differences did not reach significance among moderate depressives in the prior work (Andersen et al., 1992), and the prior work thus offered a more "absolute" demonstration of automaticity among moderate depressives than did the present study among individuals with major depression.

The notion that automaticity in the future-event predictions of major depressives, or in their future-event schemas, might be less robust than that among moderate depressives is counterintuitive. Less schematicity in the future-event representations of major depressives relative to moderate depressives would seem to be the opposite of what should be expected if increased severity is associated with future-event schematicity. Automaticity in future-event predictions, however, may not emerge quite so linearly as being a simple function of severity. Rather, automaticity may represent a kind of set point that is reached in the course of depression, a set point occurring even among those who are moderately depressed, implying that it exists in major depression as well, but does not begin there. Indeed, its assessment in major depression may be interfered with by other factors. Qualitative differences among moderate and more serious depression, such as psychomotor retardation or lowered motivation, may alter manifestations of automaticity in the latter group. That is, the constellation of symptoms associated with major depression may lead to difficulties in focusing on the task at hand (Hertel & Hardin, 1990).



The major depressives in the present study indeed showed longer raw latencies than the moderate depressives in prior work (Andersen et al., 1992). Indeed, serious depression may itself place a considerable demand on cognitive processes (Hartlage et al., 1993).

The present study of course differed from prior work on future-event schemas (Andersen et al., 1992) in the methods used to classify participants into depression groups. Whereas prior work used the Beck Depression Inventory (BDI; Beck et al., 1961), we used the Inventory to Diagnose Depression (IDD; Zimmerman et al., 1986) and included only participants qualifying for major depression, that is, those reporting a relevant constellation of symptoms for at least 2 weeks, both before the experiment and afterward. Hence, the present study examined "caseness" classification—major depression or not—in a manner stable across two administration times separated by anywhere from 2 to 22 weeks. This means that the depressives in this study were more severely impaired than prior participants in the comparable design (Andersen et al., 1992). Nonetheless, the data demonstrate *relatively greater automaticity* among these major depressives than among controls. Although we cannot definitively rule out the possibility that future-event schemas are less operative in major depression than in moderate depression, indications in the literature would suggest that other factors are likely to have interfered with its effective assessment among participants with major depression.

On a different note, prior work (Andersen et al., 1992) found more pessimism in moderate depressives than in nondepressives in two ways, both in predicting fewer positive events and in predicting more negative events. The present study showed that people with major depression predicted only *fewer positive events* and not more negative events, a pattern of findings that was unpredicted and hence any account of it must remain speculative. This finding is provocative, however, because the valence of anticipated outcomes is central to theoretical frameworks relevant to depression, such as self-discrepancy theory (Higgins, 1987). In that theory, the absence of positive outcomes is of special relevance to depression because positive outcomes and their withdrawal are crucial to ideal-self/actual-self discrepancies and such discrepancies are associated with depression (see Higgins, 1987). Although our model argues that depression is associated with pessimism and future-event automaticity, it is silent on different patterns based on the positivity or negativity of the anticipated event. Self-discrepancy theory, by contrast, provides reason to believe that this effect may be meaningful, and the data may thus contribute to the self-discrepancy literature as well.

Similarly, the present results are also broadly consistent with cognitive-mediational theories of emotion (e.g., Beck, 1974; Lazarus & Averill, 1972), which conceptualize depressive affect as resulting from the appraisal of loss of a valued outcome. These models again support the idea that the loss of positive outcomes may be central in the anticipation of future events in depression (see also Brown & Harris, 1978; Oatley & Bolton, 1985). The fact that no such pattern emerged for moderate depressives in prior work, but did among major depressives in the present work, suggests that major depression may be more likely to involve loss and a lack of all hope.

As indicated, individuals with major depression in this study experienced more

ruminative thoughts related to the future, based on their own bad experiences, than did nondepressives, an effect that cooccurred with evidence about future-event schemas in major depression. This finding lends support to our overall framework which suggests that depression can be viewed in terms of a time course beginning with strategic, effortful rumination about the future based on negative events and mild depression, then continued elaboration and rehearsal, and finally depression, as the process of making future-event predictions becomes relatively routinized. The practice effects associated with strategic rumination should lead to the onset of automaticity, so that rumination is no longer deliberate, but rather is experienced as involuntary (Andersen et al., 1992; see also Andersen, 1990; Andersen & Schwartz, 1992). A clear demonstration of this precise pattern would require a longitudinal design in which depression, rumination, and automaticity in future-event predictions are assessed over time, with strategic rumination at one point in time accounting for automaticity in future-event predictions at a later point in time, all as part of increasing severity in depression. The present research was not longitudinal and it did not yield an index of automaticity calculated for each subject that could be examined in direct relation to our (between-participant) index of rumination, which compared load and no-load participants. Although this precluded any test of the potential mediating role of rumination (as a kind of practice) in the formation of future-event schemas, the data nonetheless provide support for the hypothesis that both future-event schemas and future-event rumination are operative in major depression.

It is also worth noting that depressives in the current study showed greater rumination than did nondepressives not only about the future, but also about the self. A recent negative life event led them to experience more ruminative thoughts about the self than did nondepressives, just as they did about the future. This is consistent with work suggesting that ruminative thoughts following a negative life event deal with self-evaluation (Nolen-Hoeksema, 1991; Tait & Silver, 1989). Both rumination about the self and about the future were reported more by depressives than by nondepressives in this study, and hence each may well be associated with schemas—self-schemas and future-event schemas, respectively—based on simple practice effects (Smith, 1989, 1994), a matter that warrants future research attention.

Although these findings are provocative and do appear to suggest that both future-event schemas and rumination about the future occur among individuals with major depression, we acknowledge that the present research had limitations that suggest caution is warranted. First, our measure of rumination involved retrospect reports of ruminations based on a recent life event, and thus did not tap concurrent, ongoing rumination in the experiment. Although the rumination findings concerning future events in this research are nicely consistent with our overall hypothesis, the measure we employed did not allow us to assess directly the kind of ongoing rumination that should accompany depression, which could have enabled a better test of our model.

A second limitation is the very small sample size employed in this research, which is far less than ideal. Of course, our sample size was small precisely because of the stringent criteria we used for identifying individuals with major depression. All participants identified as having major depression qualified for this diagnosis

both in a mass testing session 3–11 weeks before the experiment and during the experiment itself. This consistency/duration requirement enabled us to rule out transient fluctuations in dysphoria of less than 1 month (since all major depression by definition has lasted for at least 2 weeks). This criterion led us to classify a small number of potential participants as qualifying for the study as major depressives, severely restricting our sample size. This obviously limited statistical power in this research and reduced our ability to detect differences, while also being compromising in other ways, suggesting that follow-up research would be useful. The main concern about low statistical power, however, is that it makes it less possible to detect effects that do exist, not more possible to spuriously confirm *a priori* hypotheses. Hence, obtaining evidence for predicted effects with low power is worthy of note, even though caution is warranted.

A third limitation is that we used a paper-and-pencil self-report measure to determine the presence or absence of major depression, which arguably provides a less precise measure of “caseness” in major depression than use of a standard structured-interview measure would have because careful follow-up questions make such interviews the current “gold standard” in psychiatric diagnosis. On the other hand, the consistency between the measure we employed and standard interview procedures for diagnosing major depression has been shown to be very high, as we have described (see Method). Hence, although the measure we used is clearly imperfect, it has very high validity in diagnosing major depression.

Finally, there is the limiting condition in this research that we examined only university students (in an ethnically diverse urban setting). Because of our exacting criteria for qualifying for a diagnosis of major depression, many of the problems of studies among college students are to an extent overcome, of course, and the use of “caseness” in major depression extends prior work among college students, who differ from a random sample, at minimum, by being largely in late adolescence/early adulthood and qualified, motivated, and financially able to attend a university.

In sum, given numerous criticisms of research on studies of subclinical depression, our examination of future-event schemas among people with major depression in the current study (even if from a college-student population) represents an important advance over prior work on future-event schemas (Andersen et al., 1992). Moreover, in demonstrating the relatively automatic nature of thoughts about the future in people with major depression along with rumination about the future, we have forged a link with the literature on rumination as well. The data thus extend the literature on automatic thoughts in major depression both into the domain of future events and into the realm of the experimental demonstration of automatic cognitive processes. Automatic thoughts are a prime target of change in cognitive therapy for depression, and the relatively rigid nature of depressives’ thoughts about the future may thus be relevant for treatment. In addition, although we regard the emergence of future-event schemas as a proximal influence on depression and assume that they may decay or become chronically deactivated by inhibitory processes when depression remits, we also speculate that future-event schemas might instead become latent among remitted depressives and may thus serve as a vulnerability factor in relapse if effectively triggered by life circumstances, matters worthy of research attention.

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